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[OFFICIAL NOTICE.]

Notice of the Sixth Annual Meeting of the Western Gas Association.

SECRETARY'S OFFICE, WESTERN GAS ASSOCIATION.
QUINCY, ILL.

To the Superintendents of the Gas Companies of the West.

I desire to call your attention to the fact that the Sixth Annual Meeting of the Western Gas Association will be held at Cincinnati, Ohio, on the 9th, 10th and 11th days of May, and herewith extend you, one and all, a cordial invitation to grace the occasion with your presence.

For the information of those gas engineers of the West and Southwest, who have not as yet favored our Association with their attendance (and I regret to say that their number is greater than it should be) I will briefly state the origin and aims of the Western Gas Association, accompanied with a few extracts from its constitution and by-laws. The preliminary meeting for the purpose of effecting an organization was held at St. Louis, in September, 1878, with an attendance of some twelve or fifteen superintendents of as many gas companies of the West. This small but successful beginning comprised the nucleus of an Association which has since developed, with rapid strides, into one of the largest organizations for the advancement of gas interests in the country. During the past four years annual meetings have been held in the leading cities of the West, and the uniformly increased attendance plainly attests the deep and growing interest taken in these yearly gatherings of the gas fraternity. More than one hundred names now stand enrolled upon our membership list, and this number should, and doubtless will, be doubled within the next five years.

The purposes of the Association, as stated in the language of the preamble, are as follows:

"WHEREAS, The manufacture and sale of gas for illuminating and other purposes has become one of the leading economic interests of the country; and, whereas, it is necessary, in order that its use shall not only continue at the head of all agents for the various purposes for which it is already employed, but that its application shall be extended into new and wider fields of usefulness; and, whereas, it is absolutely necessary that those to whom its manufacture is entrusted should endeavor by every means within their power to reduce its cost to the lowest practicable point, thereby meeting the just expectation of the consumer, as well as those having capital invested in its manufacture and distribution, and fully believing that united action on our part, for mutual improvement, will be an important step towards accomplishing so desirable a result, we do hereby ordain and establish the following Constitution"—from which I quote only the following extracts:

"ARTICLE 1. The name and style of this Association shall be the Western Gas Association.

"ART. 2.—Sec. 1. No one shall be eligible for active membership unless he is a gas engineer or superintendent, or an actual executive officer of a gas company.

"Sec. 2. The admission of special or honorary members may be provided for, but such members shall not vote nor take part in the active management of the business affairs of the Association.

"Sec. 3. All election to membership shall be by ballot, taken at any regular meeting of the Association, and no one shall become a member except by a vote of at least three-fourths of all the members present.

For the benefit of those who desire to apply for membership at our next meeting, I here insert a few quotations from the by-laws.

"ARTICLE 1. The annual meetings of this Association shall be held on the second Wednesday in May of each year, at such place as shall be determined at the preceding annual meeting, at which time the election of officers shall take place, and annual reports and settlements be made. At each annual meeting the President shall present an address setting forth his official acts, and such general items and recommendations as he may deem of advantage to the Association. All general business of the Association shall be transacted at the annual meetings, and the following shall be the order of business:

"1st. Calling roll and reading minutes.
"2d. President's address.
"3d. Presenting applications for membership and balloting.
"4th. Introduction of new members.
"5th. Reports of standing and special committees.

"6th. Miscellaneous business (which may be laid aside informally, and taken up at any time).

"7th. Special order for the consideration of the papers, drawings, models or other matters of interest to the Association, in the discussion of which all members shall be entitled to participate; and such special order may be considered at any time by a vote of the Association.

"ART. 2. Any person directly or indirectly connected with the management of gas works or gas machinery, or who may be skilled therein, shall be eligible as an honorary member of the Association. Such members shall be proposed, balloted for, and received in the same manner, and be subject to the same fees and annual dues as active members; and shall be entitled to all the privileges and courtesies of the Association, except the right to vote, hold office or participate in the management of its business affairs.

"ART. 3. Any person desiring to become a member of this Association shall make application in writing, setting forth name, residence, and occupation, with proper references, signed by two members of the Association.

"ART. 4. The fee for membership shall be five dollars, and the annual dues shall be three dollars, payable annually thereafter.

"ART. 7.—Sec. 1. The Board of Directors shall meet at least once in each year, on the day previous to the annual meeting of the Association, at which time they shall decide as to the admissibility of the various papers, drawings, models, or other matters which may be submitted for their consideration. They shall also examine and report on all applications for membership.

"ART. 8. All papers, drawings, models, etc., submitted to the Association at its annual meetings shall remain the property of the authors."

In addition to the purposes of the Association already stated may be named another, which is of no slight importance—viz., the assembling of the various gas engineers of the West for mutual acquaintance and an interchange of ideas, aside from those advanced and discussed during the formal sessions of the Association. Each superintendent feels better satisfied for meeting in a social way his neighbor. I have, in some instances, heard it remarked by those who are loath to spare the time or subject themselves to the discomforts of a journey, that they hardly consider it worth their while to attend in person, for the reason that they can afterward inform themselves of everything that was said and done from the columns of the AMERICAN GAS LIGHT JOURNAL. Now, while that statement is partly true, it is not wholly so by any means. That the JOURNAL aims to report and does report, the gist of all that occurs at the assemblages of the various associations of the country, is an undeniable fact; but, after all, this mention is the merest outline of the entire proceedings; and it is only natural, from the very necessities of the case, that this should be so. The printed report of a three days' session of an association, accurate though it may be in its every detail, bears much the same relation to the sum total of everything that has actually occurred as the head lines of a lengthy newspaper article sustains to the article itself. Moreover, there may be many members in attendance who would gladly avail themselves of an opportunity to acquire the information they are seeking after the adjournment of the regular sessions, who might naturally shrink from trespassing upon the time of the Association when it is assembled as a deliberative body, with questions which are of minor importance save to the inquirers themselves. The JOURNAL, zealous and indefatigable as it unquestionably is in its praiseworthy efforts to enlighten its readers upon all Association matters, cannot chronicle all these little disjointed discussions, nor is it its province to do so.

I may here add, parenthetically, that "gas men" are proverbial for their readiness in imparting information to their brother members upon any of the affairs of their profession. Whoever has had occasion to meet with them, as a body, will, I am sure, bear me out in this assertion.

There may be some superintendents of the smaller companies who feel that they cannot afford to incur the expense of attending these association meetings. Let me tell them that it is not expected that they will be called upon to do so. So far as I know, it has been almost the invariable custom for the companies themselves to defray the necessary expenses of their representatives. Any information gained (and I will challenge anyone to be present at one of these meetings who will not depart the wiser for his attendance) must of necessity result to the direct benefit of the company he represents. The superintendent will find, as a rule, that no argument is needed to convince the president of this fact; and in almost every instance it will be found that the expenses of the company's delegate will be cheerfully defrayed by those whose manifest duty it is to pay them.

The foregoing remarks are addressed more particularly to the engineers and superintendents who have not as yet attended any of our meetings. To those whose names are already enrolled on our lists I feel that anything I might say upon this subject would be simply superfluous. From practical experience, they are well aware of the important benefits to be derived from these yearly reunions; and I know that nothing but matters of the most urgent necessity will prevent their attendance.

The coming meeting at Cincinnati promises to be an unusually interesting one. I have received positive assurances from a number of our most eminent gas engineers, stating their intention to present papers for the consideration of the Association, and their names are sufficient guarantees of their owners' power to treat the subjects selected with their recognized ability. That they may be greeted by an audience as large as it should be the pride of the Western Gas Association to furnish, is the deep-felt wish of

Yours very truly,

A. W. LITTLETON, Secretary.

IMPROVED LIGHTING.

During the past five years there has been very decided progress in the scientific use of gas for the production of large as well as small lights. The gas world was fully aware, before the advent of electric lighting as applied in the arc system, that gas was not developing anything like the illuminating power that it might; but inasmuch as this proportional increase seemed to depend upon an increased consumption, there was very little chance of encouragement in this direction from public authorities, who objected most decidedly to paying for the extra gas, although there may have been no objection to the extra light. Hence it was only by giving away the extra gas that the companies could obtain an opportunity to demonstrate the possibilities of gas light. Mr. William Sugg, of London, working on scientific lines, brought out his large Argands, which were a great success for places to which they were adapted; but they were attended with the inconvenience of chimneys, which required cleaning and replacing occasionally. For ordinary use something was demanded more like the common flat flame burner, free from chimney and other fixtures. The large Bray & Sugg flat flame burners, and others of similar construction, quickly supplied this want; and, although not so economical in gas consumption as the Argands, have given good results, and some splendid street lighting has been done with them. The results obtained with them, so far as diffusion and uniformity of lighting on the roadways is concerned, are all that can reasonably be desired when properly arranged.

In Paris the Paris Gas Company have in use a considerable number of large burners, made by arranging several flames concentrically, so that the edges meet. These are employed at corners and crossings, in addition to the usual lights, and give a flood of illumination well distributed over the ground at places where it is most required. In Germany, Mr. Frederick Siemens, leaving altogether the beaten track, brought out, about three years ago, his regenerative burner, which, for economy of consumption, steadiness, and brilliancy exceeds any other burner yet devised. As stated in these columns recently, one of these, burning 50 feet of gas an hour, gave a light, when carefully tested on the photometer, of 500 candles, or 10 candles per foot of gas consumed. There have been many others patented, but as yet they have not come into practical use.

The application of these different systems depends so much upon the particular circumstances of the case that no hard and fast rule can be given for every case. The first thing demanded in good lighting is thorough diffusion, or such a distribution of the light as to illuminate all points equally. This is very difficult to accomplish in street lighting, and cannot be done well by large lights at considerable distances apart, for there is always too much light at some points and too little at others. It would seem that the best possible results, so far as evenness of lighting is concerned, would be obtained by placing lights of moderate magnitude (say 50 or 60 candles) sufficiently near to each other to enable their light circles to meet each other; and then at important points put up, in addition, the larger lights to increase the quantity. This, of course, involves burning more gas; but in important thoroughfares this ought not to be an obstacle. In many streets a flood of light is not necessary, as all that is absolutely required in ordinary streets is light enough to prevent collision and to mark the corners of streets. But in the larger thoroughfares the case is very different. There should be plenty of light and no heavy shadows; and this can be accomplished much more cheaply with gas than with electricity. Or, putting it in another way, there could be much more light obtained for the same money from gas than from electricity. This can easily be seen by simply calculating how many ordinary street lights might be placed on a block at the same annual expense as the electric light for the block.

As to interior lighting, for large spaces, halls, etc., there can be nothing more satisfactory than the Siemens burner; for its use insures thorough ventilation and a perfectly steady and thoroughly diffused light. An application of this kind has just been made at the main office of the Manhattan Company in this city. The room is 75×100 feet, and was formerly lighted by about forty Argand burners, one on each desk, and by bracket lights at the sides. For these lights four 500 candle burners were substituted, placed about four feet from the ceiling. Each burner has a twelve inch pipe over it, extending to the roof. The result is the perfection of lighting, added to thorough ventilation, which was never before enjoyed.

But, notwithstanding all this progress, there is much more that may be done. Better burners will be invented, and the price of gas so far cheapened that

the quantity of gas burned will not be the question asked, but the quantity of light obtainable will be what people wish to know. Put down the price, and the people will find ways enough to use all the gas that can be readily manufactured.

[Society of Gas Lighting.]

The "Standard" Washer-Scrubber.

By Jos. R. Thomas, M. Am. Soc. C.E.

The following paper was read before the Society:

In the early part of last year the Williamsburgh Gas Light Company had erected at their works two of the "Standard" washer-scrubbers, each of a nominal capacity of 600,000 cubic feet per diem. These scrubbers were put into operation on Feb. 28, 1882, and have been in use since that time.

In the commencement of working through the scrubbers the gas was taken from the hydraulic main by the exhausters, and then into the scrubbers, and after this into the condensers and washer, and then to the purifiers. While working in this way fresh water was used in one-fourth of the chambers of the washer, for the removal of any carbonic acid or ammonia passing the scrubbers.

In working the scrubbers in this way a decided improvement in the gas made was readily perceptible; and in an average of eleven days, with and without the scrubbers, with the same relative proportions of the same kinds of coal, there was an average increase of the candle power of the gas of 0.7 of a candle while using the scrubbers.

The temperature of the gas in this method of using the scrubbers was as follows:

For the month of March.—Average temperature at inlet, 98°–98°; at outlet, 87°–84°. Air temperature, 42°. Liquor delivered, 8 oz.

For the month of April.—Average temperature at inlet, 103°–103°; at outlet, 90°–90°. Air temperature, 49°. Liquor delivered, 7½ oz.

For the month of May.—Average temperature at inlet, 109°–110°; at outlet, 97°–97°. Air temperature, 57°. Liquor delivered, 7 oz.

For the month of June.—Average temperature at inlet, 114°–115°; at outlet, 105°–106°. Air temperature, 73°. Liquor delivered, 7 oz.

For the month of July.—Average temperature at inlet, 112°–113°; at outlet, 104°–104°. Air temperature, 78°. Liquor delivered, 7 oz.

For part of the month of August, from the 1st to the 10th day.—Average temperature at inlet, 114°–114°; at outlet, 105°–106°. Air temperature, 79°. Liquor delivered, 7 oz.

The test for the strength of the liquor, in all cases above mentioned, was made with the liquor at a high temperature; and, by reducing the liquor to an average temperature of 60°, it would fully average a 9 oz. liquor for this period of time and manner of working with the scrubbers.

In a number of careful tests made it was found that, the normal temperature of the liquor being 60°, liquor of 70°, showing 9 oz., was, by reducing the same to 60°, increased 1 oz. in strength; or giving a liquor, at that temperature, of 10 oz., showing that a reduction of 10° in temperature was equal to 1 oz. in the strength of the liquor.

The expectation was, in this first method of working the scrubbers, that the discs would soon clog up with tar, and prevent the efficient working of the scrubbers. Such, however, was not the case, as the greater part of the tar deposited in the scrubbers was held in solution by the liquor, and passed off very readily with it; and any heavy tar settling in the bottom was drawn off easily at the lower cock in the chambers, which was done about once per month; and the same thing has to be done in the present way of working them.

After having the scrubbers in use in the manner mentioned above for a period of five and one-third months, we had new connections made, and changed the manner of working them by passing the gas first through condensers and washer, and then through the scrubber, not using any water in the washer, it acting simply as a condenser, and all the water used being in the scrubbers alone. After this change in working the scrubbers, the temperature of the gas was as follows:

For the month of August, from the 11th to the 31st.—Average temperature at inlet, 81°–81°; at outlet, 84°–84°. Air temperature, 75°. Liquor delivered, 10 oz.

For the month of September.—Average temperature at inlet, 80°–80°; at outlet, 83°–82°. Air temperature, 70°. Liquor delivered per ton of coal carbonized, 32⅞ gallons, of 10¼ oz. strength.

For the month of October.—Average temperature at inlet, 75°–75°; at outlet, 77°–77°. Air temperature 60°. Liquor delivered per ton of coal carbonized, 33 gallons, of 10 oz. strength.

The liquor from the scrubbers is run into a pipe which carries off the condensation from the condensers, and also the tar and ammoniacal liquor from the benches; and the whole of the liquor is carried to the separator, and then into the tanks for tar and ammoniacal liquor. I particularly mention this, as I think the liquor is improved in strength by doing so, as, although the liquor from the scrubbers has shown a variation of from 12 to 21 oz. in strength, that received in the tank has not varied over 2½ oz.

The question of how to make our residual products more valuable, and which has received very careful attention from this Society, I think can be partially demonstrated in producing a more valuable ammoniacal liquor.

While we, in this "enlightened" country, are receiving back for our products about one-third of the cost of our coal, our English cousins are very far ahead of us in this respect, they getting back from their residuals fully two-thirds of the cost of their coal to them. The best result obtained by them financially, I believe, is when they work up their residuals (the tar and ammoniacal liquor) at their own works; and I think a very serious question to be considered by the gas manufacturers of this country is whether, at an early date, it will not be more profitable for all of us to do the same thing.

A quite inexpensive plant can now be obtained for the manufacture of sulphate of ammonia, and I believe that any company using the liquor in the manufacture of it can get a much better result financially than any of us are at present getting for the liquor made at our works.

In conclusion, I would state that after eight months' use of the scrubbers we are very well satisfied with them. The gas made being very free from ammonia, carbonic acid, and the sulphur compounds, and the machines requiring very little care and attention in the working of them. The average speed with which they have been driven is 4½ revolutions per minute, and the water used in them 1.2 gallons per thousand cubic feet of gas manufactured.

Financially they have also proved very successful, as we have received for the liquor made, in the eight months they have been in operation, $2,831 over and above the amount received for the corresponding eight months of the previous year, before the scrubbers were put in operation.

This is certainly very satisfactory, and I hope it will assist in solving the problem of how to make the gas the residual product of our manufacture, which all are so desirous of accomplishing.

In every way that the cost of gas can be reduced in its production, it must, and will, no doubt, receive the most careful attention on the part of those engaged in its manufacture. The progress already made in this direction will add a further incentive for far greater efforts on the part of all to reduce the cost of production to the very lowest figure. A saving in the cost of manufacture will enable us to sell at lower prices, and everything tending in this way will be more satisfactory to all, and more thoroughly assist us in making the standard light of the future continue to be, what it has been in the past, pure carburetted hydrogen gas.

The Petroleum Outlook.

The situation in the field at the close of the month of February justifies the opinion expressed in our last issue, "that nothing but the discovery of a new district like that of Bradford, with a uniform and certain deposit of wide extent, will give us a continued accumulation of stocks, and the incidentally prevailing low prices, such as we have for several years past; and fortunately for the holders of stocks no such district is at all indicated by any existing development."

The new work in the Allegheny, Bradford, and Warren fields has been slightly increased during the month, while the aggregate production from new wells has fallen off nearly 1,000 barrels per day.

The Forrest county territory is being more and more clearly defined and settled as unreliable territory; and is no longer looked upon as a formidable producing field, as the drill has developed about five dry holes to every one good producing well. While the number of wells are being increased the production in this field, instead of increasing, is actually decreasing.

The average price of crude for the month was one dollar and one cent ($1.01), which is the highest average for any month since 1880.

The stock has continued to increase in the producing region up to the close of the present month, as the shipments have been very small for the past four months.

The total production for the month shows a slight decrease, and the field statistics, received up to March 22, indicate a larger decline for the month of March.

The number of drilling wells at the close of the month was 151, which is a smaller number than in any corresponding month since 1876.

The number of drilling wells completed during the month was 126, which is less than in any corresponding month since 1874.

The pipe line runs from the wells were about 65,000 bbls. per day for the month, taking all the production and drawing from stocks at the wells, about 3,000 bbls. per day.—*Petroleum Reporter.*

BRECKENRIDGE CANNEL.

On the opposite page we present to the readers of the JOURNAL a descriptive map of the celebrated

BRECKENRIDGE CANNEL COLLIERY.

Twenty-five years ago this cannel possessed a reputation never before attained by any other cannel, foreign or domestic. Its perfect purity, regular fracture, strength, and compactness made it a singularly attractive coal. In appearance it resembles "jet," and has sometimes been called "jet coal," from the fact that it has often been wrought into delicate ornamental articles which take a high polish.

This colliery, which has been unworked for several years, has recently passed into new management, and the preparations necessary to put it in thorough working order are now being rapidly pushed forward. It is confidently expected that the equipment will be completed and the management in a position to supply the cannel in the latter part of July or early in August of the present year.

To the older gas engineers of this country the Breckenridge cannel needs no introduction. The original charter of "The Breckenridge Cannel Coal Company" was granted by the State of Kentucky Feb. 9, 1854, the main object of the company being the manufacture of illuminating oil from the cannel, for which purpose it had no competitor but the now exhausted Albertite of New Brunswick.

One ton of the Breckenridge cannel will yield about 140 gallons of crude oil, from which can be obtained 80 gallons of illuminating oil, 12 gallons of paraffine oil, besides other products, such as aniline, benzole, etc. *The above result is more than double that of any American, English, or Scotch cannel now obtainable.*

Upon the discovery of petroleum the manufacture of oil was abandoned, and the colliery has been practically idle down to the present time. No cannel has received more general attention than that which has been bestowed upon this deposit. *Its remarkable value as a gas enricher* has been discussed in all the geological works of the country. To gas engineers now using oil in any manner as a gas enricher, the Breckenridge cannel offers a substitute possessing advantages which cannot fail to be appreciated, among which may be mentioned the following:

SAFETY.

While it contains all the valuable enriching qualities of naphtha, it is in such form that it needs no careful watching to prevent explosion.

EVAPORATION.

Every consumer of oil is aware of the great loss from leakage and evaporation which occurs while that article is in transit to the gas works, in many cases increasing the original cost of the oil over 30 per cent. We have specimens of Breckenridge in our possession which were mined twenty-five years since, and are as perfect now as fresh mined cannel, although exposed to the elements for so many years.

SUPPLY.

The excellent water and rail facilities which the company possess enable them to deliver the cannel as wanted, rendering it unnecessary for consumers to carry heavy stocks at any one time.

The State of Kentucky, in granting the charter to the Breckenridge Cannel Coal Company in 1854, authorized and required the Governor of that State to appoint three commissioners to examine the property of the company with a view to its proper valuation. This commission consisted of Professor Benjamin Silliman, Jr., George D. Prentice, Esq., and the Hon. Bryan R. Young; and their report to Governor L. W. Powell, dated February 21, 1854, contains a full and complete description of the property of the company. The following extracts will give a general idea of their conclusions:

EXTENT OF FIELD AND CHARACTERISTICS OF COAL.

"This bed of cannel constitutes the peculiar value of this property. Your commissioners satisfied themselves that it extends under a very large part of the entire territory of the company; we feel that it is safe to say that the cannel measure underlies *at least four thousand acres* of the land owned by the Breckenridge Cannel Coal Company. Its thickness may be set down as three feet for the whole territory, although it was somewhat more in several places. The character of the cannel is remarkably uniform at all points; and we examined it in about twenty different places in a circuit of eight or ten miles. The character of this cannel coal is entirely peculiar, and unlike any other cannel with which your commission is acquainted. Its peculiarities are—

"1st. The ease with which it ignites.

"2d. The power, volume, and endurance of its combustion, and its freedom from snapping explosions.

"3d. Its entire absence of loss from transportation and repeated handling.

"4th. Its resistance to atmospheric influences—frost, rain, etc.—by which all danger of slacking is avoided.

"Its easy combustion enables it to burn on the hearth of a common open fireplace, such as is used for wood. A single lump once ignited will continue to burn until it is all consumed. No shavings, or even paper, are required to ignite it—it will burn easily from the touch of a lighted match. Its combustion is attended with intense heat and most brilliant, voluminous flame.

"A chemical analysis, made under unfavorable circumstances, reveals the remarkable percentages of

63½ per cent. of volatile matters;*
27 per cent. of carbon;
8½ per cent. of ash; and about
1 per cent. of water.

"Very few cannels have been observed which approach this richness in gas. A later analysis gave but *seven per cent. of ash;* and it is believed that this will be still further reduced in practical working. Of sulphur there was scarcely a perceptible trace.

"In comparing this cannel with the Hillsboro coal (Albertite), your commission discovered a resemblance in chemical composition, but a dissimilarity in general appearance, the Breckenridge showing a larger per cent. of volatile matter; *it is entirely free from slate.*

"In several places where we uncovered it for the first time, only a few inches under the surface, and even on the surface, we observed that there was not the least decay or disintegration in it, but the angles stood out sharp and clear. No better evidence could be desired of its capacity to resist atmospheric influences.

"Its remarkable elasticity is worthy of notice; it is also strongly electrical by friction, in which particular it is matched only by the equally remarkable coal from Hillsboro, New Brunswick, before mentioned."

In concluding their report the commissioners express the opinion that the property of the company contains *a minimum of twenty million tons of cannel*, the royalty on which should be twenty cents per ton—making a valuation of *four million dollars.* Or, quoting from their report to Governor Powell: "We do not, therefore, hesitate to return $4,000,000 as the estimated value, by our appraisement (under your commission), of the property of the Breckenridge cannel coal company."

In 1875 a reconnoissance of this cannel field was made under the direction of the Kentucky Geological Survey, and a report of the same was submitted to Professor N. L. Shaler, State Director of that survey. This latter report confirms all that the earlier commission had developed, with the advantage that in the meantime the cannel had been worked to some extent for the manufacture of illuminating oil; and, had not the discovery of natural oils been made, there is little doubt that a prosperous business would have resulted.

Prior to this later examination, and during the manufacture of oil, several cargoes of the cannel had been shipped down the Mississippi river to New Orleans, and thence reshipped to New York, where its value as a gas enricher was at once recognized and appreciated. The marked interest manifested by the older gas engineers in the States in the re-opening of this colliery at the present time is the result of their experience with this cannel in former years.

The new company will possess unsurpassed facilities for the distribution of their cannel to required points in the *United States, Canada, West Indies, South America,* and *Europe.* The mines border directly on the Ohio river. The shipping station is at Cloverport, Kentucky, as shown on the map. From this point the company can connect with the entire system of the Pennsylvania Railroad Company, thereby reaching any required point north, east, or west, while its location on the Ohio river (which at this point affords ample depth of water) brings the southern markets all within easy access.

Cloverport is 110 miles westerly from Louisville, and 100 miles easterly from Evansville, from either of which points rail communication is reached.

Cincinnati is 260 miles from the colliery.

Chicago is about 300 miles, via. Rockport or Evansville.

Cairo, the junction of the Ohio with the Mississippi, 190 miles.

New Orleans is 1,182 miles from the colliery by the river.

Tidewater on the Atlantic is reached by all rail to South Amboy, N. J., from which central point the New York and New England markets, as well as Southern Atlantic ports, can be supplied as needed at short notice.

Samples of the cannel can be seen at the office of the undersigned, who have been intrusted with the re-introduction of the article in the market. Samples will be sent and particulars of price, etc., forwarded upon application to

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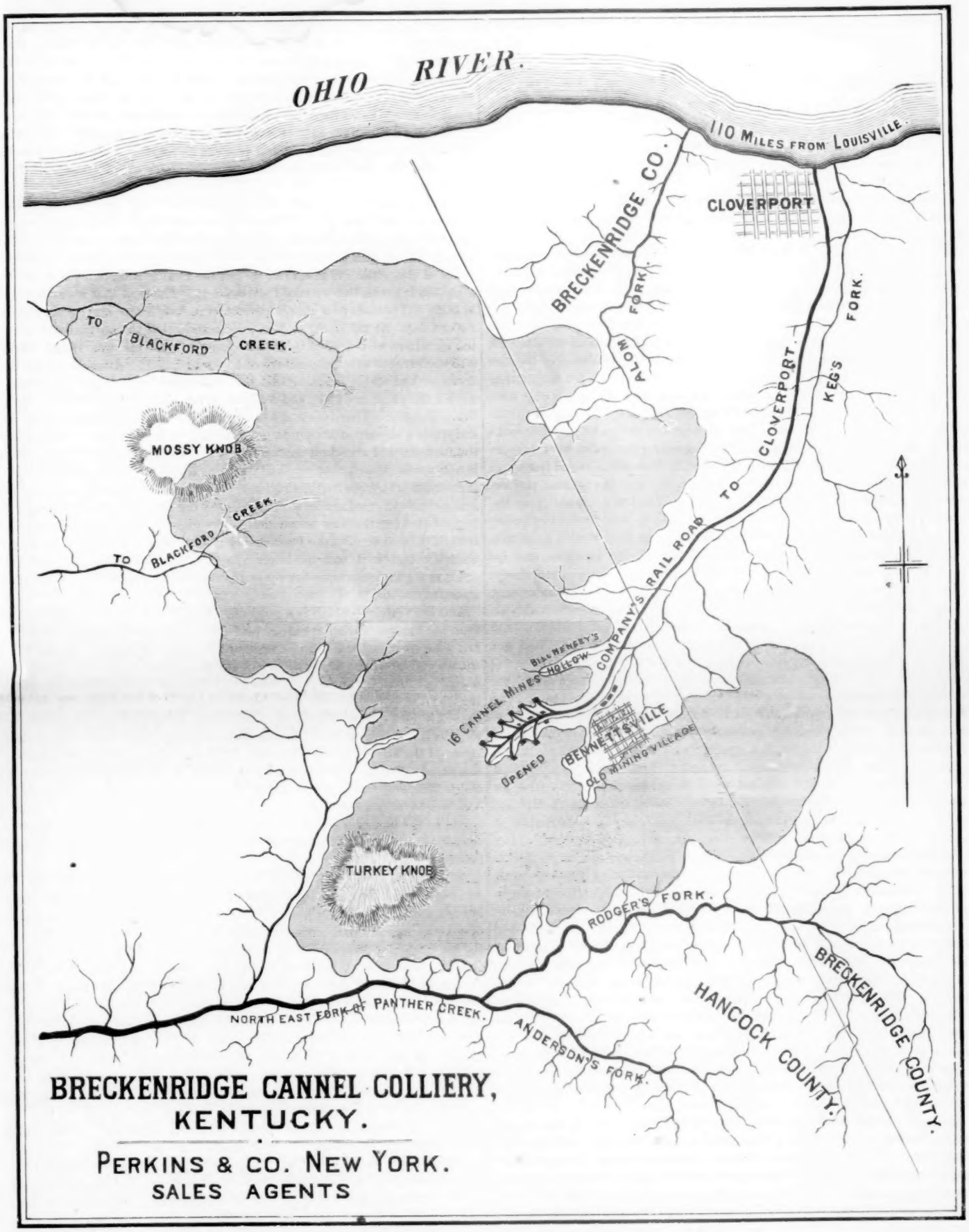

MAP OF THE BRECKENRIDGE CANNEL COLLIERY, KENTUCKY.

This celebrated colliery is located directly on the Ohio river, at Cloverport, Kentucky. The cannel deposit embraces an area of over four thousand acres. A full description of this colliery will be found on the preceding page of this JOURNAL.

PERKINS & Co., General Sales Agents,
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[Official Report.—Continued from page 154.]

Thirteenth Annual Meeting of the New England Association of Gas Engineers.

Held at Young's Hotel, Boston, Mass., Feb. 21 and 22, 1883.

Second Day, Feb. 22.—Morning Session.

REGENERATOR FURNACES.

The President—I understand that Col. Stedman has prepared a paper. We will hear from him now.

Mr. Stedman—I have not prepared any paper; I have brought with me some data showing the working of our regenerator furnace, which I will read if the Association would like to hear it.

We constructed, early last spring, a furnace on the regenerative principle, making the alterations from the old style of furnace in the simplest possible manner. So far as the construction of the furnace is concerned, it consisted simply in deepening the original furnace, so that we could carry about 4 or 4½ feet depth of fuel all the time. Of course the usual precautions were taken about guarding the supply of air to the furnace; and we also took measures to heat the supplementary supply for the combustion of the carbonic oxide produced. This was effected by passing the air for the supplementary combustion through channels which were surrounded by the flues which carried the waste heat from the benches, so that the heating of the air was effected by recuperation. We took no heat for the air from the coke furnace, but only from the waste heat of the gases. In order to work the bench, of course we had to make a pit below the floor of the retort house, as we had previously no cellar there; but the deepening of the pit and the excavating of a cellar were, in effect, about all the changes we made from the original furnace.

We first fired this furnace on the 31st of March, and dried it with a smouldering fire for one week. Then we gradually opened the draughts and increased the heat until the 14th of April, when we began charging regularly, (using 500 pounds in three retorts), and then kept on gradually increasing the heats until the 1st of May, when we concluded that the retorts had been gaited long enough to give the heat a chance to show what it would do. On May 3 we burned off 1,000 pounds in four hours, in three retorts, and got ready to try three-hour charges the next day. But the next day the heat fell off, and continued to fall off until, after vain efforts to improve it, we let down the bench. When cooled off we discovered that the delivery ports for the supply of air for secondary combustion had nearly closed; the heat, at the time of greatest intensity, having evidently caused the furnace blocks to settle in such a way that the original apertures in the face of the block had entirely closed near the back of the furnace, and those near the front wall had been reduced to half their original size. Notwithstanding this, the air meter showed that the proper volume of air was being taken in at the entrance to the cold air flues. Here was a weak point in the construction of this bench. We wanted to keep down the cost of its construction, and so did not take the proper precautions to avoid the leakage of air from the air flues to the draught flues. The air was heated originally by passing twice through the bench—or rather four times through the bench. It went backward, then forward, underneath the lower escape flues, and then went backward and forward next time between the escape flues for the waste heat of the bench. The air was divided in the lower channels from the waste flues by iron plates, which we happened to have on hand as the relic of an old washer. These plates were a half inch thick, and were laid so as to overlap each other. They made a partition between the waste flue and the hot air flue one inch thick, of iron. As we learned afterward, that was a very improper thing to do, owing to the fact that the hot air oxidized the red hot iron very rapidly; so that in the course of five or six weeks of continuous working the iron was nearly destroyed, and we had to abandon the lower heating flues and limit our air heating to the temperature attained in the passage between the waste heat flues.

The first firing was for two months. We re-fired (after cutting out the air ports to a proper size) on August 14. After we got fairly to work, through the remainder of August we burned 298 pounds to the charge. In September we burned 294 pounds, and in October 265 pounds. These were the average charges for the retorts at that time. In the latter part of October the heats began to go down again, and our experiments showed a deficient air supply to the furnace gases. Notwithstanding this fact, the air meter showed that the air was going in in sufficient quantities at the entrance to the air flues; but it was plain that it did not reach the furnace, and we suspected that the air ports had in some way got fouled again. So we let the bench down again on October 31, having run it for 2 months and 18 days. We then cut out the air ports, straight through into the air flues, of sufficient size, so that there would be no possibility of any further trouble from their clogging. We re-fired on December 10, the average charge for the remaining 22 days being 291 pounds. In January the average charge was 286 pounds. Through February the charges have been diminished, because we had no use for the gas, and were obliged to restrain the heat of the bench, which was fairly good. The second time we found the air spaces had fouled with a sort of clinker, formed apparently by the accumulation of dust drawn in by the air and burned just at the orifice through which the air made its escape into the combustion chamber. As we contemplate altering the next bench in the stack to this style of furnace, we shall try to construct a division between the air and the waste flues in such a way as to provide, if possible, for confining the air in its proper channels, and prevent its leaking into the waste flues. We found that that tendency was the weak part of our bench all the way through.

Perhaps you think we have not obtained any very extraordinary results from the regenerator plan. I do not give them to you with any purpose of boasting of them, because we have sometimes done rather better in yield of gas per bench with the old furnace with the bridge-wall setting. One peculiarity of this setting is that after we got the heat to a certain point we could maintain it there, but we could not drive it. The best that we ever did was to burn 333 pounds to a charge per retort in four hours, and we did that only for one day. At the time, we felt quite certain that the air channels confined the air where we intended to have it, and that the air was being admitted into the furnace at a temperature of 1,000° or 1,200°. After we let the bench down we had ample evidence that the tiles between the waste gas flues and the air flues had cracked; and we have never since been able to overcome that difficulty. There seemed to be times when these cracks would open, and quite a supply of air would get through, thus diminishing the supply to the furnace, and also diminishing the power of the draught. However, the bench works so well that we shall continue to use it, although we do not get the results which we had anticipated. In its ease of management we think it is a success. Ordinarily we only clinker the bench once in 48 hours; and, beyond shaking the bars occasionally—say once in two or three hours—we are not obliged to give the furnace any attention at all, other than to draw the hot coke into it from the lower retort, or such portion as is needed in order to fill the coke chamber up to the necessary height—just below the entrance of the air.

Another feature—which is a good one, as we think—is that during all this time the furnace walls have stood perfectly intact to all appearances. The last time we examined them (a week or two since) the furnace bricks were as square and free from any evidence of sloughing away or of burning off as when first fired. The foreman remarked a day or two ago that he did not see why the furnace should not last fifty years. It will last an indefinite time if it does not burn away any faster than it has during the five or six months it has been in use. The ease of its management takes a great deal of labor off the stoker, and enables him to transfer his labor to the handling of more coal. The fact that the clinkering has to be done only once in 48 hours, and is then very easily done, makes the labor of clinkering quite easy in comparison with what it is in the old furnace, where you have to put the bar in in the face of a red-hot furnace, and then bang away for a time with tremendous energy to break off the slag which has accumulated on the bricks.

At the same time we have been running this we have been running a furnace on the old plan, and have relined it twice in order to keep the furnace in such a condition that we would not ruin ourselves because of the quantity of coke we had to burn. Another advantage is the economy in coke. At the best, when we were running the largest charges, 25 per cent. of coke, by measure, was ample to burn off the charge. We always estimate 36 bushels of coke to the ton of coal; but I do not believe that that is enough, because whenever we make an experiment we can always get a little more than that. By careful measurement we can generally measure off 40 bushels to the ton of coal. Whenever we sell that 40 bushels we can only make out about 36 bushels the second time we measure it. The consumer of the coke to whom we deliver it avers that he only gets 34 bushels; so there seems to be a gradual diminution, occasioned, I suppose, by the breaking of the large lumps and from the more compact way in which it lies in the basket.

I have a good deal of faith in the theory of recuperation. I believe that there is much to be gained by highly heating the air. If you will consider the difference in the effect of admitting air to the combustion chamber at the temperature of 60° and at 1,000°, you will at once see that there is quite a saving of fuel effected by the process of recuperation. Our German friends claim that they have so perfected the furnace that they can regain 68 per cent. of the heat which ordinarily escapes from the bench. It is only a certain portion of the heat which is really effective. When we get up to a temperature at which we can carbonize the coal, it is the temperature in excess of that point that is absorbed into the retorts in the carbonization of the coal; and of course, in the ordinary furnace, the balance escapes, and that escape is inevitable. It is only that portion which is above that certain temperature, which is necessary to effect perfect carbonization, that we can use. Just as when we heat a boiler all the heat below 212° must necessarily

go up the chimney and is of no avail in producing steam, so in the retorts there is a certain portion of effective heat that we are obliged to maintain; and any portion of that which we can bring back into the furnace, and there utilize it, is certainly a great gain in the consumption of fuel. The Germans now claim, with their furnace, to carbonize 100 pounds of coal with 10 pounds of coke; that is, with what we would here call 10 per cent. of the fuel. They also claim to have entirely done away with the necessity for clinkering.

There are two kinds of regenerator furnaces; one which seeks to narrow the aperture at the bottom of the grate; for the purpose of melting the slag as it accumulates by creating an intense heat at the aperture—so intense, in fact, as to cause the metallic portion of the ash, after it has become clinkered together by the lower heat maintained in the upper portion of the coke, to be again melted, and to run down as liquid through the aperture. I believe furnaces have been used in that way quite successfully in this country. Another kind keeps the area at the grate bars as large as at any portion of the furnace. That is for the purpose of reducing the intensity of combustion. If we could at once produce the necessary amount of carbonic oxide, without having so much intensity in the combustion chamber as to fuse the metallic portion of the ashes, you can see at once what would result. The reduction of coke to ash would be the whole process; and there would be no occasion for producing any clinker at all. You will notice, from the reports made of the workings of the German furnace, that it is said to make no clinker. Only ash is made which is very easily removed from the furnace by shaking the bars, or any ordinary means.

There is another advantage in the use of steam below the grate bars which modifies the intensity of the heat in any portion of the coke chamber, and reduces it below the point at which clinker is produced.

In order to effect this reduction of heat a large amount of water must be evaporated; and we have not the apparatus necessary to evaporate that amount of water.

A bushel of coke, weighing forty-four pounds, allowing about 9 per cent. for the ash or foreign matter which we generally find in the best cokes, would give us forty pounds of carbon to a bushel, or forty pounds of combustible material to each bushel of coke. Roughly estimating, each pound requires 80 feet of air at a temperature of 60°, to burn it to carbonic oxide, and 80 feet more to make it into carbonic acid. Forty-eight bushels per day in the furnace would mean two bushels per hour, or 80 pounds of carbon consumed per hour, by the air supplied, half of which is needed for the primary combustion. If a good draught gives 54,000 feet per hour velocity, then about 17 square inches of opening is required for the draught and the same area would be required to supply the necessary air for supplementary combustion. About 13,000 feet of air per hour, raised to the temperature of the bench, requires an expenditure of much fuel. That is why I wish to impress upon your mind the fact that recuperation is a very good thing; and that the only way in which we can recover the heat of the bench, to any great extent, is in heating the air supply. Some have gone so far as to heat the primary as well as the secondary supply; heating the air for the combustion of carbonic oxide by utilizing the waste heat as it leaves the bench at first, and then using still more of that waste heat to heat the supply for the primary combustion of the coke, and to effect the evaporation of sufficient water into steam, to pass into the coke chamber to reduce the energy of combustion therein. If, instead of throwing away all the heat below, say 2,000°, we can utilize one-third or one-quarter of it, it means that we are saving fuel; and not only that, but we are increasing the energy of combustion and raising the effective heat to a much larger proportion of the whole.

It is pretty generally conceded that we make about 40 bushels of coke per ton of coal. Certainly from what we have heard here, it is not a very large assumption, that we can roast off a thousand feet of gas with a bushel of coke. If that be so, then the production of 10,000 feet ought to be effected with about ten bushels of coke. That would be considered almost unnecessary in a well constructed and well managed regenerator. At any rate it is not without the limits of possibility to sell thirty bushels of coke per ton of coal, and still maintain a splendid heat to work off good charges.

However incredulous you may now be about that (and I expect that the incredulity will be expressed presently) I think within a year or two you will concede that that result is very easily attainable. From thirty bushels of coke, at 8 cents per bushel, we realize $2.40; and we ought to get 60 cents for the fifteen gallons of tar realized from each ton of coal. Mr. Page thinks that we ought to get $1.60; but he does not come forward and offer it. We ought also to get at least 50 cents for the ammonia, and I dare say we shall get more than that when we are able to reduce the manufacture of gas to one of the exact sciences. That would yield us a little more than $3.50 for residuals. Any gentleman can take a hypothetical case, with coal at $5 per ton, and see what the balance would be. Perhaps the surplus coke realized by the saving would be so large as to reduce the price of all the coke sold; this would reduce the apparent saving effected by the adoption of the better mode of firing. Those are figures which you can modify to suit the prices of the various residuals in your respective localities. I think that is within the attainable, and is not entirely beyond the reach of some of us. I do not know that I can as yet effect so great a saving as that.

I have tried to give you, in a crude way, my experience in this matter. I have not had time to prepare a paper; but I have noted down the data in a rough way, and have tried to give you the benefit of my experience to the best of my ability.

Discussion.

Mr. Greenough—I was not in the room in time to hear the introductory remarks of Col. Stedman. I wish to ask him a question. Do I understand that he has a grate furnace or a slit furnace.

Mr. Stedman—A grate furnace.

Mr. Greenough—Then the statement about the absence of clinkering he has not been able to demonstrate by practical test. I think the gentleman is entirely sound in many points that he has taken. I have no doubt, especially when settings of more than sixes are used, that it is perfectly feasible to heat the retorts with twenty-five per cent. of the coke made; which would give, as the gentleman from Newport suggests, thirty bushels of coke to sell, per ton of coal carbonized, provided he gets forty bushels. Whether he can sell the coke for eight cents per bushel depends, of course, upon the circumstances in which he is placed. Situated as we are in Boston, with coke almost a drug upon the market (we shall be happy to sell an almost unlimited quantity to anybody who will take it) there is no especial object for us to spend money in recuperation for the sake of effecting a saving in coke. But with many gentlemen I have no doubt different circumstances prevail; and I have no doubt that to a person who has a ready sale for coke, a good gas furnace with a regenerator apparatus attached will prove a very satisfactory investment. I expressed that opinion three years ago; I have had no reason to change it; and in fact I am confirmed in it. The difficulties which have arisen from time to time in the manipulation of this furnace, have, I think, been overcome, and there is now no difficulty, with care and patience, in making a gas furnace which will maintain the retorts at as high a temperature as may be desired, without seriously injuring the retorts or the furnace. It was stated here last year that we had stumbled about, at our works, from one difficulty to another, like a man walking around a room in the dark and stumbling over the chairs, and who learns how to avoid them by bruising his shins. I think we have now got through with our experiments in that direction; and can now construct and run a gas furnace which will give any moderate degree of heat required without destroying the apparatus, either in the furnace or in the ash. There are various things which are absolutely essential to the proper construction of furnaces. One essential is that there shall be a high draught. I do no think it is possible to successfully run a gas furnace with the ordinary short chimney constructed in common works. That has been our experience. Others may be able to do differently, but that is what we have found; that a common draught was not sufficient to run the work satisfactorily. You must also have an absolutely tight furnace. No amount of money is thrown away which is spent in making the furnace absolutely free from the introduction of air, except at the point where you want it.

The gentleman from Newport made some statements, as to the quantity of air necessary for combustion, and the space required to introduce the air, which have not been entirely in accordance with our experience. We have not undertaken to figure up the velocity of the air passing in, or the quantity of air necessary to consume the coke; but we have tested with great care the products of combustion and the gases coming from the furnace and from the arch. Certainly the quantity of air which is passing in is amply sufficient; and a very small opening of the air flues produces such an effect upon the temperature of the furnace that it is obvious that the air introduced must come almost entirely from those flues. And yet, as the gentleman has himself seen, the secondary air supply, from which we admit the air into our furnace, would not be over an inch and a half by one inch at the outside. The primary air supply is larger than that; but the secondary air supply which we use is extremely small. And yet, in the gases as they come from the furnace, it is my recollection that in the recent analyses which we have been making, we have not got over six or seven per cent. of carbonic acid. And yet this small quantity of air suffices to change that carbonic oxide in the balance of the gas into carbonic acid before it leaves the arch. It seems to me there must be some difficulty connected with the draught, which he does not understand, if he finds it necessary to use so large a secondary air supply, when we can get along with so small a one. That is one point to which I wish to call his attention. The difficulty with which so many people have met, and which we have experienced, of having the interior of the furnace so hot that the bricks were eaten up—we have now entirely gotten over. As anybody can see, and as I have had the pleasure of showing several members of the Association, we have a furnace upon which you can put your hand; for the furnace from two feet down, to the top, is practically cool. The violent combustion takes place only in the portion of the coke where the air first comes in, and before it has become carbonic oxide.

The members of the Association have so frequently visited the Boston Gas Works that we have not felt that we could offer them a sufficient inducement to come down there again; but we can certainly show them a furnace supplied with cold coke, which stands and does not eat out, and which keeps the retorts at as high a heat as we care to have. For we do not believe in very high heats. The experience of the gentleman from Providence has, I think, been comparatively unique. I have yet to hear of any other place, on this side of the water, or on the other, in which the running of the retorts at a temperature sufficient to work off 300 pounds of coal in three hours, has not been attended with so great disadvantages as to cause its abandonment. Of course every man is satisfied with his own work; but when he compares it with the work of others and finds that nine men out of ten had an experience precisely like his own, it of course confirms him in his feelings. So long as we ran three hour charges, and at a heat sufficient to work off 300 pounds of coal in three hours, or anything like that, we made a large quantity of fine cannel in our hydraulic mains, and we stopped our retorts and our stand pipes, and we had the various other difficulties which were to be expected. And on the other side of the water, and wherever they have done the same thing, the same difficulties have been met with; and although they had introduced an ingenious arrangement (which I understand the gentleman from Providence has put in his hydraulic main) for the purpose of removing the pitch, they abandoned it because they found that the difficulties attending its use were too great. I do not advise anybody to undertake to make 12,000 feet per retort from any such size of retort as is in common use, even if they can get the heat; but I do believe that we can get from 9,000 to 10,000 from a retort by putting in properly constructed apparatus; and that you can get that without any special amount of recuperation; or you can save your coke if you wish to spend the money in putting in an apparatus to retain some of the heat which you are wasting. We are not at present running our retorts at any such a heat as that.

We have found the question of draught to be a somewhat surprising one to us; and there is no fire which we have at present which is working off over 275 pounds per retort in four hours. We constructed four fires, and built a chimney which we thought would be amply sufficient to take off the products of combustion from these fires, and give it a high draught. To our surprise it has not done so. The fire nearest the chimney has been as hot as we could possibly wish it. In fact we were working off about 300 pounds of coal. Sometimes we ran that bench with 1,800 pounds of coal to a charge, and worked it off very handsomely. We began to be afraid as the fires got hotter, that we might have some difficulty with the apparatus; and as we were looking for a fire in which we could control the heat and keep it down, we have from time to time opened our air flues half an inch or more and cooled the fire down to a temperature at which we are confident we would have no trouble. We will not run our works at such a rate as to give us trouble in our hydraulic main. In our judgment that would not pay. We neither want five and a quarter feet to the pound, nor do we want to work off any larger quantity of coal than 275 or 300 pounds to a retort per four hour charges. We do not think that it will pay in the long run. But we do believe in running the retorts at that heat. We have no question at all that what is most needed is a system of furnaces (where one man will furnish the brains, and another man will simply have to shovel the coal in at the top of the furnace at certain hours) with which you can control your heats, and keep them at the temperature which you desire, and not have that difficulty which every manager of large sized works finds, of having the heats down and not being able to get them up again when needed. The experimenting which we have been through has convinced us that it is possible to build a satisfactory furnace, and that no gas works can be laid out for the future, (certainly no large works) which does not contemplate the use of some system of firing retorts by gas.

Mr. Armington—I understood our friend Col. Stedman to say that, on the other side they thought it possible, (or perhaps they had already reached the point) to heat the retorts with ten per cent. of the coke made. This coke question seems to be cropping up all the time.

Mr. Greenough—That means ten pounds to the hundred.

Mr. Armington—I understand that. That is the point I make. Do I understand my friend to say that they had arrived at that point?

Mr. Stedman—They claim to have reached that; yes.

Mr. Armington—It seems to me that, taking your case, where you have gone so economically, and taking your own statements with regard to the coke, that if you had enough of those furnaces you would not need to use any coke at all to keep up your heats; and would get about one and a quarter per cent. ahead of anything you have yet made besides. In one portion of your paper you said that a bushel weighed forty-four pounds, and that you got thirty-six bushels to the ton. That gives a weight of 1,584 pounds to the ton. You afterwards tell us that you got forty bushels of coke, which at forty-four pounds would be 1,760 pounds. Now the difference between those two is just 11.4 per cent. So that, taking your two measures of weights—in whichever way you may come at it—you would be firing your house, and getting all the gas you wanted, and still have one and a quarter per cent. more of coke to sell than the whole that you made.

Mr. Stedman—That is correct. That is just the way that I figured it.

Mr. Armington—You did? All right then!

Mr. Stedman—I said that we got by careful measurement of coke from the retorts, forty bushels; and it seemed to be the general impression of gentlemen who have spoken on the subject, that in the Westmoreland or Youghiogeny coals there were about forty bushels of coke per ton of coal carbonized, which could be realized in practice, or at least in experiment. When I gave the figures, as I had made them up, from calculation of the amount of air necessary for combustion, I said that a bushel of coke weighing forty-four pounds, with only nine per cent. of ash in it, would leave about forty pounds of carbon. I did not say that our coke weighed forty pounds. The gentleman will please give me credit for the difference between the hypothesis and the actual experiment.

Mr. Armington—I beg your pardon. I understood you in the first part of your paper to say that, and afterwards to state it as you have now done.

Mr. Greenough—Do I understand you to say that your coke, without water in it, weighs forty-four pounds per bushel?

Mr. Stedman—No; I did not intend to be so understood.

Mr. Greenough—If coke weighs forty-four pounds to the bushel it must be coke which has been saturated.

Mr. Stedman—I beg to call the gentleman's attention to the fact that this is only a hypothetical case; I gave it simply for the purpose of getting the figures into such a shape as to avoid fractions. If a bushel of coke weighed forty-four pounds, and there were nine per cent. of ash in it, after deducting the ash, the burning of eighty pounds of coke per hour would require so much air for primary, and so much for secondary combustion. I gave those figures only for the sake of avoiding fractions, and the multiplication of small figures, and as being a simple way of getting at it. I suppose, from data which we shall be able to gather presently, we will get at about the average weight of a bushel of dry coke. I apprehend (as must be evident to everybody) that there is a good deal of difficulty in computing the weight of coke. If we calculate on forty bushels of coke to the ton of coal, the forty bushels of dry coke must weigh a good deal less than forty-four pounds to the bushel; and in taking the hypothetical figures which I did, I may have misled some of the members. But I figured the area of the air ports, the velocity of the draught, and computed the necessary supply of air for the amount of carbon being burned. The idea which I intended to convey was not that we made any such weight as that; because I think it is highly probable that our experience tallies with that of many others, which seems to point to the making of about one pound of coke to 1.6 pound of coal.

Mr. Stiness—I do not understand that that is an answer to Col. Armington's question. I think the gentleman has rather hedged. He made a statement yesterday, which was received with something of credulity by the gentleman from Cleveland, that so much gas could be produced from so many pounds of coke. Now he states (not hypothetically, I believe) that he uses so much coke under his furnace, and sells a certain quantity. I do not question his statement in the least. The point with Col. Armington and myself (and which we have not been able to figure out) is, how is he able to get from thirty-three to thirty-six bushels of coke, and to sell thirty bushels of coke to his consumers, and still run his fires so as to produce such results. According to the figures which Col. Armington has made, he has not used any coke at all, but has produced a very large amount. That is the point which we would like to have elucidated. We do not seem to have brains enough to get it through our heads.

Mr. Stedman—Will the gentleman please state the figures as he understood them? I am not quite able to answer his question, when he says that I said that I produced so much gas from so much coal. Possibly I may have failed to make my statements with sufficient plainness to be easily understood.

Mr. Stiness—I have a letter from a gas engineer, one of the most intelligent among our class, and I will read to you a little of his experience. He says: "We were rating coke at the average of thirty-six bushels to the ton. My foreman had increased to forty bushels, as the basis of keeping the coke account. I asked him why he changed. He said that we were selling thirty bushels per ton, and he was ashamed to say that he only used six to carbonize a ton of coal, so he thought it would look better to call the product forty bushels to the ton." That is the simple point we want to get at; how a man can run a furnace, produce but thirty-six bushels of coke to the ton of coal, and sell thirty bushels.

Mr. Armington—I think it is is hardly fair for our friend Stiness to go at our friend Stedman in this manner. I stated yesterday that I had had a pretty hard time here, with Boston prodding me, and saying all sorts of sharp things to me. I think that Mr. Stiness and I ought now to keep quiet for a while, for I see that our Boston friend has got his pencil out, and I have no doubt he will soon commence a little prodding on his own account, in order to find out about these results.

Mr. Stedman—I think that the letter read by the gentleman from Pawtucket fully justifies me in my figures. The writer seems to have had similar experience.

Mr. Greenough—Certainly the gentleman from Brooklyn has never had any occasion to complain of a want of courteous treatment in this town. When he has propounded certain extraordinary statements we have ventured to ask him for information, or for the data upon which his conclusions were based? When a man makes a statement of any kind before this Association, which is in any respect new or striking, he must expect to have his statement criticized; and more especially is this the case if his statement happens to run counter to what has been the experience of most of us. I do not suppose that any gentleman present objects to courteous criticism of his assertions. The way in which we venture here to call attention to our differences of judgment is to the last degree mild as compared with what is done on the other side of the water. I would like to have some of the gentlemen who object to being criticized, attend a meeting of the British Gas Light Association and see the way, after some member has made a statement, in which the members spring up all over the house with their papers and statistics in hand, to criticise, and to fairly scalp the man before they get through with him. The statement which I have been thinking about is that of Mr. Stedman, with regard to the wet coke, and the consequent escape of the air supply. He evades criticism by calling his statement hypothetical; and says that his hypothetical bushel of coke weighs 44 pounds; and taking 9 per cent. of ash out of that 44 pounds he gets 40 pounds of actual fuel to figure on. If he states that merely as a hypothesis, then I reply that his hypothesis is not founded upon fact, according to my experience. If he claims that his hypothesis is correct, then I say that his experience has so far been different from ours that it may perhaps have to be accounted for by a difference in the quality of coal. It is my recollection that some coke which we had analyzed during the past year contained more than 9 per cent. of ash, that there was, in fact, 11 or 12 per cent. of ash in the coke. I may be mistaken in my recollection, but my impression is that it was considerably more than 9 per cent. Furthermore, as to the 44 pounds of which his bushel of coke consists, I venture to call his attention to the fact that he has not 44 pounds, nor even 40 pounds of fixed carbon in that bushel. A very careful series of experiments has convinced us that the average bushel of dry coke, which has been saturated with water, will weigh almost the same as that; and in all our coke figures we estimate that a bushel of saturated coke, from which the water has been allowed to run, will weigh 45 pounds; and that 44 pounds will not fill the bill. In my opinion he has not got quite 40 pounds of fixed carbon to work off from his bushel of coke. Therefore I claim that his figures with regard to his air supply are entirely incorrect; and that no such air supply, as he has figured on, is necessary. Of course I may be in error; but that is the criticism I would make upon his paper. And I should put against his statement the fact that with a very much smaller air orifice we burn off much more coke than he does.

Mr. Stedman—I will again state that I only took these figures as affording a ready means of reckoning. Suppose that in taking the estimate of dry coke, we should estimate it at 1,500 pounds; at 40 bushels per ton, that would give 37.5 pounds per bushel; and a deduction of 10 per cent. would leave 33.8, or about 34 pounds of carbon.

Mr. Greenough—That is nearer to it; but that would upset your air orifice.

Mr. Stedman—That would upset it to the extent of about 15 per cent. I state this, not as a guide to anybody, but I had in my mind when I figured it the impossibility of your obtaining all your supply through your narrow orifice, unless you had a rate of velocity of the air supply which very far exceeds our experience in Newport. When we get a good draught we have a velocity of a thousand feet per minute; and at times, when the air is in a certain condition, we run as high as twelve hundred feet per minute. But that is only in the primary air supply.

Mr. Greenough—What is your draught at the bottom of the chimney?

Mr. Stedman—I do not know what it is at the bottom of the chimney; I think it is about three-quarters of an inch in the draught pipe. The chimney is 80 feet high.

Mr. Greenough—Do you mean at the bottom of your orifice?

Mr. Stedman—No; at the bottom of the orifice to the furnace it is about 0.2 of an inch. I was speaking of the bottom of the chimney. We have never actually put the gauge into the chimney; but near the chimney, if I am not mistaken, it shows very nearly 0.7 of an inch. We had no delicate apparatus for determining within a fraction what it is; but by the use of an ordinary gauge I ascertained that it was about 0.2 of an inch at the furnace. The only reason why I deduced those large figures was to determine whether a certain aperture would be required by a certain velocity of air for the combustion of a certain weight of coke. I suppose I should have made more careful experiments. I was so amazed, when visiting the Boston Works, at the smallness of the aperture through which their secondary air supply went, that on going home I looked carefully over our air supply with a view to a comparison of results. I have not analyzed the gases coming from the bench. I think it would require a series of analyses, because at different periods of the charge in the furnace there must be quite a different ratio of gas being evolved. I think that when you first throw in the coke there is a difference between that period and the time when the coke is incandescent.

Mr. Lamson—How hot is your furnace?

Mr. Stedman—The furnace is so cool that the walls are just as intact as when we first built them.

Mr. Lamson—Is the upper part of the fuel cold or hot?

Mr. Stedman—The upper part is in a state of moderate incandescence, so that the pieces of coke are very distinctly visible; the intense combustion being above the union of the air and the gases, or just above the point where the air comes into the combustion chamber.

The President—I wish to correct what may possibly be a wrong impression with regard to the working at Providence. Mr. Greenough, in referring to the Providence works, said that we provided the hydraulic main with an easy method of getting at the dip in case of stoppage. But we have now had the main in use for eight months, and have never touched the plate nor opened the main.

Mr. Coggshall—I would like to ask Mr. Stedman whether he had the port holes closed up, and then enlarged them; and what was the size after your last enlargement?

Mr. Stedman—A great deal larger than was necessary. The necessary air supply should come in through half a dozen ports on each side of the furnace—say 2 × 1. That was the original layout. Those ports were closed up after the first month's firing. In practical working they were found not large enough, and we cut them out twice after that. Once we cut out the ports just far enough back to enlarge them, and then again cutting through; now we have them not simply large enough, but very much too large; so that now any material coming in with the air, and burning near the orifice of the air port, cannot, for a long time at least, obstruct them again.

Mr. Armington—You have not tested that yet?

Mr. Stedman—Yes; we have tested it.

Mr. Armington—With what results?

Mr. Stedman—The results are not quite as good as they were at first, owing to the fact which I have stated—that the secondary air supply is not so intensely heated now as it was when we sent the air back and forward once more than we do now. I suppose that is the reason. Certainly the amount of air supply is now entirely within our control, with the exception of the partial escape of the air into the waste heat flues. It is an important point, in the construction of a bench like that, to have the waste heat flues and the air flues made of such material and constructed in such a manner that you can guarantee their integrity for a long time.

Mr. Lamson—Have you made any tests of the gases in the furnace?

Mr. Stedman—I have made no analysis of the gases.

Mr. Lamson—In our works, with a very small aperture where the secondary air supply comes in, we find that if we open the aperture but very slightly and allow an additional supply of air to go in, we can notice the cooling of the furnace in a very few moments.

Mr. Stedman—There is not a shadow of doubt, from the manner in which your fire is made there, and from the manner in which the combustion goes on in the secondary chamber, that you are getting an ample supply of air; but it bothered me to see how you could get it all through that small orifice; and the question arose whether there were not some obscure air leaks into the furnace, in which case the effect of opening the air supply a little wider would be precisely the same as if all the air went in through the open flue in the first place. If you are already getting air enough for combustion, you will, by letting in a little more, cool down the furnace.

Mr. Lamson.—In the five furnaces we have been experimenting with in the last year, the air has been brought in in four different ways—different, I think, in each furnace. In some cases the air was brought back and forth hot, on the sides of the furnace, in brick flues. In other cases it was brought back and forth in iron pipes. In another case it was brought in directly in front of the bed, and heated underneath the outgoing gas flues. In every case, when the furnace was not working properly, these air supplies were found too small.

Mr. Sherman—I would like to ask Mr. Stedman if his furnace is patented.

Mr. Stedman—There was a patent taken out with regard to it. The patent is in the hands of Mr. Stanley, who furnished the materials for the construction of the furnace. I suppose that the patent principally covers the mode of heating the air.

Mr. Lamson—It is possible that a part of the incoming air goes out through crevices in the outgoing flues. I suppose there is nothing but tiles between them?

Mr. Stedman—That is all.

Mr. Lamson—Are those tiles rabbeted?

Mr. Stedman—Yes; they are rabbeted and laid together very carefully; but having let the bench down twice I think it possible that they may have cracked.

Mr. Lamson—The space seems very large to me. In our furnace, and in all the other furnaces that I have ever seen working, the aperture is very much smaller.

Mr. Stedman—I think, if you will figure out the amount of air requisite for combustion, you will, unless I have made a mistake, find it difficult to account for the proper amount which is necessary for the secondary combustion, coming in through so small an aperature as you have there.

Mr. Greenough—I would like to amplify a suggestion which Mr. Lamson has made with regard to the loss of some of Mr. Stedman's draught. That is, if he has a vacuum of 0.7 inch at the bottom of his chimney, and has only 0.2 inch at the entrance of his air pipe, it might be that a very considerable portion of that air is sucked into the chimney, and that he is losing more than he thinks he is. There is no question that we have some leakage of air in our furnace, but it is extremely small. At one time when we found that the furnace was getting very hot, we shut off the air supply altogether, but found that we still had combustion of the coke. We then instituted an investigation, and discovered that there was a leak, and that the air was passing into the air flues without pursuing the proper methods. At that time we had the furnace hotter, and burned less coke, than at any time since. If there is any means which can be instituted to keep those flues tight, which we have not tried, I would like to know what it is. In some of our fires the air has passed in through three inch wrought iron pipes, with very carefully made joints, and carried right to the under side of the incline where it passes up into the furnace. I do not see how there can be any appreciable leak of air there. Certainly I cannot in this way account for the difference between our experiments and those of Mr. Stedman.

Mr. Stedman—I would like to point out again that, even if we are losing air (and I do not doubt that we are so losing it between the two channels, one for the waste gases and the other for the air flues), and even if we were losing a considerable portion of the amount which we required to be put in, yet there is theoretically an air supply which we cannot easily dodge. If we consider that the combustion of a pound of carbon requires a certain quantity of air, and we are satisfied that the combustion is completely effected, we certainly must admit that a certain volume of air has reached the gases in order to supply the necessary oxygen, and to convert the carbonic oxide into carbonic acid. Upon that I base my theory of the supply of air, and not so much upon my own experiments, which of course had to be graded to the circumstances. If we find that we are using too much air, the furnace cools down; and if we are using too little the furnace cools down. If we open the air draught for the primary supply too large, we promote too much intensity of combustion in the furnace, and produce slag and clinker, but do not produce any more heat. We use more coke and have more trouble with the furnace, and we create carbonic acid in such case, which is not thoroughly reduced; and then the air supply is in excess of the gas, and acts to cool rather than to heat the bench. But certainly, whenever a given number of pounds of carbon burn, the production of carbonic oxide requires a certain amount of oxygen, and that oxygen is contained in a certain volume of air at the temperature of 60°. Then the carbonic oxide itself requires the addition of an equal volume of oxygen, which is contained in an equivalent volume of air at the same temperature. So that, in figuring on this hypothetical case, I simply gave what aperture I thought would be necessary, with a certain velocity of draught, to take in the requisite quantity of oxygen. I would like to state, in relation to the possibility of the draught of the waste gas flues being so much greater than the air flues, and hence drawing in a great deal of air from the air flues, that both the air flues and the draught flues are checked by the same damper. So that whatever pull there is on any part of the bench is pretty uniformly maintained all the way through, barring the fact that the circuitous course of some of the gases causes more or less obstruction to the velocity of the flow.

[To be continued.]

The Management of Small Gas Works.

By C. J. Russell Humphreys.

[Continued from page 147.]

Pressure gauges will be placed throughout the works at convenient points. Those of the small syphon style made of glass tubing of one-eighth inch bore, will be conspicuous by their absence, as they are inaccurate in their indications and difficult to keep in order. The glass gauges will be made of tubing of one-half inch bore. We will have at least two "King's" gauges, also a pressure register for the exhauster and another for the governor house.

Pipes connected with the different parts of the works will be carried into the Superintendent's office, and be so arranged that any of the pressures can be quickly taken.

A bar photometer will also be placed in the same room. We are aware that there are not many small works boasting so expensive an appliance, but irrespective of size, we think a gas works incomplete without the means for determining the value of its product. A jet photometer is a valuable adjunct as it can be rated by the bar photometer from time to time, but we have not faith in it as sole criterion of the brilliancy of the gas.

Provision will be made for heating all the buildings with steam supplied from the boiler, and care will be taken not to use two feet of pipe where one will suffice. We will bear in mind that it is necessary to keep the temperature of the rooms only above freezing point, and that it is not intended to use the buildings for hot house purposes. As a case in point, in the purifier house, we will run a steam pipe around each box underneath the lute, the steam passing in succession around each purifier; by this method we will supply the heat just where it is wanted, and can so do the work at the minimum expense. Sometimes coils are run around the walls of the purifier building, but this plan uses an unnecessarily large quantity of steam. All the steam pipes passing under the ground will be covered with two inches of asbestos felting covering, and the same kind of conduits above ground, when not used for heating purposes, will be treated in like manner. Further, fully recognizing that steam is money, we will provide storm doors for the rooms that have to be kept above freezing point in winter.

An iron track, the gauge to correspond with the width of the coal wagon, will be laid between the coal shed and retort house. The roadway, running the length of the works, will be lighted by three gas lamps; but we will keep them well away from the purifying house. Later on, when we have the clinkers and tar, this place will be improved by a heavy asphaltum covering.

The size of the main pipes must be governed by the distance we have to run; consequently, we cannot lay down any positive rules to be adhered to in this particular. We will have the leading main ten inches in diameter. Three inch pipe will be the smallest size we will lay. Before a foot of pipe is laid, it will be well to have made a map of the city showing all future streets, so that branches can be put in at any point where a roadway will eventually lead off. On this map should be marked the distance from the curb to the main, the depth of the pipe, the position of every branch, showing the size of the outlets, and whether they are spigot or bell openings, also all drips and valves.

If there be one leading street to the town, we will lay a six inch main through it, and the branches off therefrom will be three, four or six inch, according to circumstance. Of drips we will have as few as possible, and at the same time avoid having any level main.

The pipage system will be divided into sections by a series of valves. We will give this matter particular care, and be very cautious when deciding on the position of the gates, that the most good may be done with the number of valves we feel we can afford. A one inch pipe will be tapped into the main at either side of the gates, and brought to the street service within the gate cover; these pipes will be used for testing the mains.

For services, we will use wrought iron pipes, tarring them well before they are laid. A mixture of tar and turpentine will be used for this purpose, and it will be applied at least three weeks before the pipes are required so that it may become thoroughly set.

We have only to repeat that our map will be a complete representation of our pipage system.

Having thus touched upon a few points in connection with the erection of gas works, and the proper lay out of the plant, we may now pass on to the subject more particularly in hand, namely, the management of *small* gas works. We wish to call the attention of the reader to the italicizing of the adjective which indicates the size of the concern which is to receive our attention Our solicitude on this score is the greater because we appreciate fully that many of the points to which we will refer in future pages are so clear and patent that a manager, who has committed to his care the conduct of a large or a medium sized works, will be inclined to wonder at our commenting on them.

We, however, feel that there are many small works which can only be made to pay by giving most careful attention to every little detail involved in their conduct.

We may in this connection revert to a remark made at the beginning of our dissertation, to the effect that in our opinion there are very few small gas works but could be made to pay if properly conducted, by noting that one essential of good management, is to give the closest attention to each and every detail, no matter how insignificant it may appear on the surface. In a word, then, there is no item too unimportant to receive attention at the hands of the manager of a small works, and therefore it is not possible for us to fall into the error of being too precise.

[To be continued.]

Petroleum Oil in Russia.—The quantities of Baku oil in view for the season of 1883 are said to be enormous—the best authorities estimating the quantity at 25,000,000 poods. A pood is equal to thirty-six pounds weight.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Report of Superintendent John H. Knowles, City Gas Works, Richmond, Va.—From the report of John H. Knowles, to Mayor Covington, of Richmond, Va., giving details concerning the operations of the City Gas Works, for the year ending January 31, 1883, we glean the following:

Tons of coal carbonized, 12,291; coke made during year, 440,136 bushels; coke used in retort house, 194,321 bushels; coke used in other parts of works, 17,400 bushels; gas made, as per station meter, 123,494,000 cubic feet; gas consumption, private consumers, 87,347,172 cubic feet; total public consumption, 24,108,603 cubic feet. The total number of public lamps at end of fiscal year 1882, was 1,232; during the last fiscal year 13 more were added, making a total of 1,245; total length of mains, 47 miles and 4,984 feet. The maximum production of gas in any one 24 hours occurred on the 29th of November, 1882; the quantity made was 552,000 cubic feet. The maximum consumption occurred on the 28th of November, the quantity delivered reached 541,731 cubic feet.

The Auditor reports the disbursements and receipts on account of current expenses as follows:

Received for gas		$175,279.47
Received for coke, &c		13,400.08
Total		$188,679.55
Disbursed for expenses	$84,750.62	
Disbursed for coal	50,812.28	
		$135,562.90
Excess of receipts over expenditures		$ 53,116.65
To which must be added 24,108,603 cubic feet of gas consumed by street lamps and public buildings at $2.00 per 1,000		48,217.20
6,662½ bushels coke to City Mission at 6c		399.75
1,087½ bushels coke to Relief Committee at 6c		65.25
Amount ammoniacal liquor furnished Virginia Chemical Company		890.52
Total in favor of the works		$102,689.37

Gas Matters in Baltimore, Md.—The Baltimore gas war now wages in earnest, and rates have reached a very low figure. Secretary L. R. Smoot, of the Consolidated Gas Light Company, announced on March 26, through the advertising columns of the Baltimore *Daily Sun*, that, on and after April 1, and until further notice, his company (except in the case of existing special contracts) would furnish gas to its customers at a discount of $1.00 per thousand, on the prompt payment of bills, making the net price $1.00 per thousand. It is reported, on good authority, that the Consolidated Company contemplate a still further reduction, to 50 cents per thousand, at the points where the Equitable Company comes in direct competition with them.

The card published by Secretary Smoot was immediately followed by another bearing the signature of Henry Y. Attrill, President of the Equitable Gas Light Company. Mr. Attrill's card is as follows:

"The home company will continue to sell gas to its patrons at $1.00 only per 1,000 feet, as it has done for the past fifteen months, to the benefit of the citizens of Baltimore. We ask the public to continue to help us in extending our business, as they have so generously done heretofo e, and not to fail us at this time. We beg to ask for 50 per cent. of the business of this year."

Mr. Attrill was "interviewed" by a reporter of the Baltimore *Daily Sun*, on gas matters generally, and on the matters of the Equitable Company in particular. From this interview we make the following extracts:

"Mr. H. Attrill said he knew the other corporation had trouble in collecting $1.90 from part of its customers while the others were served at $1.00, and this may be one of the reasons for the reduction. Another object, probably, was to meet the Equitable in the general extension of its mains during the present year. His company has secured the signatures of householders in different localities and proposes to go on with pipe-laying. They have laid seventy miles in Baltimore, and the damage done in carrying out the work was inconsiderable. He estimated the annual gas consumption in Baltimore, at 700,000,000 feet, and he claimed that his company, by bringing about the reduction from $1.90 to $1 a 1,000 feet, has saved $630,000 to the consumers. He first came to Baltimore a dozen years ago and engaged in the People's Gas Company enterprise. Then the price was $3.80, and the new venture put down the figures to $3.00. Next the Consumers' Company, a Baltimore venture, made the rate $2.00, and after that came the Equitable. This company has $800,000 in bonds, representing one-third of the amount expended on the property. The stock is held by the owners for its value in the future, and the business is carried on upon the most economical mercantile basis. Gas cannot be furnished at $1.00 and pay a fair profit, considering wear and tear of plant and other items, but a little more than $1.00 will bring satisfactory revenues to his company. To-day, with the modern appliances, gas at $1.50 or $1.60 will pay as well as $2.50 did a few years ago, and he will never willingly assent to a $1.90 rate again. He said his company might almost expect the people of Baltimore to offer to give a little more than $1.00 for gas in view of the benefits already afforded. At any rate, they have come to stay."

It is further reported that the Consolidated Company have purchased the exclusive right to manufacture gas, in the State of Maryland, under the patents of Thomas B. Fogarty. We are not in a position to state this authoritatively; but from present information, are inclined to think that such an arrangement has been made. There is likely to be more trouble ahead on the score of the city's contracts. City Councilman Weyler reported to the Council a resolution instructing the Comptroller to pay the gas company $1.00 per thousand for gas used by the city, the price now paid by private consumers, and this resolution has caused considerable discussion. The contract with the Consolidated Gas Company stands in the way of the resolution. Mr. Weyler states that he offered the resolution more as one of inquiry than otherwise, hoping that the Committee on Ways and Means would be able to do something in the matter. The law officers of the city, Messrs. Poe and Veazey, were both spoken to on the subject, but declined to express an opinion, claiming that they had not thoroughly examined the question as yet. Mayor Whyte also thought that the question would likely be a difficult one. A contract was concerned, and he (the Mayor) thought a contract had two sides. Mayors and Councilmen, as a rule, are always of the opinion that contracts are made merely to bind the contractors, and never consider that municipalities are bound by them in any respect, more particularly is this the case when an opportunity for a "strike" presents itself. The Baltimore situation would appear to have just about reached this delicate state. We will await future developments.

The Station Meter for the New Works of the Boston Gas Light Company.—The contract for building the station meter for the new Commercial Point works of the Boston Gas Light Company, has been awarded to the New York manufactory of the American Meter Company. The meter is calculated to pass 2,500,000 feet in 24 hours. The cases, which are to be of wrought iron, and to be furnished by the Continental Iron Works, are 15 ft. 6 in. by 15; the drum is to be fitted with patent stationary shaft.

San Francisco Gas Affairs.—The San Francisco Gas Light Company, of San Francisco, Cal., surprised and pleased its shareholders by declaring a dividend of $100,000, on the 17th of March. The payment of dividends has been suspended by this concern for some time back; but it is now expected that they will be continued with all the old-time regularity. The company reports that business is flourishing, and this state of things is very encouraging when the street lighting muddle, at present existing there, is taken into consideration. If the company can report progress in business under these circumstances, we must congratulate them upon the outlook when municipal matters are straightened out.

The Central Gas Light Company of the same place does not appear to have such a good report to make. Instead of declaring a dividend they have levied an assessment, or as these things are more familiarly known among mining shareholders, an "Irish dividend," of $60,000. J. H. Eichbaum has succeeded Byers (formerly Superintendent of the gas works at Manhattan Beach, Coney Island) as engineer. The Hanlon-Campbell process having proved a failure, the Central Company are working under the Lowe system, using heavy crude oil. The results are unsatisfactory, and the consumers are constantly complaining.

Norfolk Va.—An electric light company has been organized at Norfolk, Va. We don't suppose that they will pay *over* 100 per cent. on the capital invested; at least not for the *first* year!

Price of Gas in Philadelphia, Pa.—The price paid for gas in Philadelphia, Pa., is $1.90 per thousand. If accounts are not paid within five days from rendering of bill a penalty of 5 per cent. additional is incurred.

Electric Light in Brooklyn, N. Y.—Strange to say, the city of Brooklyn has never tried the experiment of lighting any portion of its streets with the "arc" light. We refer to the public street lighting, there being quite a number of the "arc" lights at certain points; but these have always been maintained by private individuals for advertising purposes and the like. A corporation, however, has just been formed, and the incorporators have applied to the Aldermen for a franchise. The title of the company is the Metropolitan Electric Light Company, and the incorporators are ex-Fire Commissioner McLaughlin, Justice Massey, H. H. Wheeler, Henry Beam, Charles E. Miles, Thomas A. Kerrigan and Edward Freel. Here we have the same old crowd of personages who have "ruled" Kings County matters for so many years. We miss the names of Kingsley, Keeney, Stranahan,

and some others; but presume they are in the ante-room, and will doubtless uncover themselves at the right moment. There may possibly be some connection between the formation of this ring-savoring combination and the fact that the awards for street lighting have not yet been made for the ensuing year. Who knows?

Gasoline Explosions in Philadelphia, Pa.—Lighted candles and the "festive" gasoline usually make trouble when they meet. Edward Resheimer, of the South Second Street Market, Philadelphia, Pa., is now thoroughly convinced of this fact. He had occasion to visit the cellar of the market to procure a three-gallon can of gasoline; to enable him to find the object of his search more readily he carried a lighted candle with him. He found the can, and that right quickly. Shortly after finding it the butchers in the adjoining booths heard a hissing sound followed by a loud report, with the simultaneous appearance in the air of sundry articles of stall furniture. When the boy was picked up out of the debris he was found unconscious, and was taken to the Philadelphia Hospital for treatment. He will recover. A similar explosion occurred in the cellar of building at 123 Market street. William Ormsley was seriously injured. The lower floor of the building was raised about 6 feet, and the cellar door was blown into the street.

Electric Light at Fitchburg, Mass.—A concern called the American Electric Light Company has located in Fitchburg, Mass. It has a capital stock of $100,000 divided into 10,000 shares of the par value of $10.00. In order to secure the privilege of issuing shares of a par value of $10.00, a charter had to be obtained in the State of Maine, as the laws governing the formation of stock companies in Massachusetts prohibit the issue of stock of a par value of less than $100. The $10 clause is to enable the "dear people" not overburdened with $100 notes, but who may, at the same time, be the possessors of some stray "tens," to come in and participate in the benefits to be derived from *prospective* dividends. The proprietor of a large drygoods establishment in the town has agreed to install seven lights in his store, and has further agreed to keep them employed for a period of six months. The lights are to burn six hours each night, and are to be charged for at the rate of 10 cents per hour per light. This will make our go-ahead drygoods man's bill for "arc" lighting for the space of six months amount to $756. His gas bill for the corresponding season of 1882 amounted to just $156. However, the drygoods man is also the "head-center" of the electric light company that proposes to do the work, and this will go a long distance towards accounting for the milk in the Fitchburg cocoa-nut. The stray "tens" spoken of above will probably be still kept in circulation, although we think they (the bills) will not be paid out in dividends.

The Pintsch Light.—The captains of vessels, as also the pilots who ply in the waters of New York Harbor and approaches, speak in terms of the highest praise of the Pintsch gas illuminated buoy in the Swash Channel. We have in our possession a very interesting document, from the pen of vice-Admiral S. C. Rowan, U. S. N., written in response to a request for information, regarding the working of the Pintsch and Foster systems, from the Secretary of the Treasury. This communication we will place before our readers as soon as possible.

Gas Investigation Ordered in Brooklyn, N. Y.—The Brooklyn Board of Aldermen, through the Committee on Lamps and Gas, ordered the following proceedings to be taken. "The Lamp and Gas Committee directed that a communication, of which the following is a copy, be sent to Health Commissioner Raymond:

"The undersigned, members of the Committee on Lamps and Gas, do request that you cause to be made an analysis of what is known as water gas, manufactured by the Fulton Municipal Gas Company of Broklyn, of coal gas manufactured by the Brooklyn Gas Light Company, and investigate to what extent the use of water gas is more dangerous to public life and health than is the use of coal gas.

"We also request that you cause to be complied a list of all deaths caused by the inhalation of illuminating water gas in the city of Brooklyn, and in the city of New York, since its introduction in 1878; also a list of all deaths caused by the inhalation of illuminating coal gas since its introduction in Brooklyn in 1849, and in New York since 1878, together with the proportion of each gas used in New York and Brooklyn within the above period. And, also, in what States of the Union has the use of water gas or any gas containing more than 10 per cent. of carbonic oxide been prohibited by law; and report to this committee at your earliest convenience. Yours respectfully, George H. Sterling, Robert Hill, Owen E. Houghton, Philip Casey, Committee on Lamps and Gas."

No action will be taken on the gas contracts pending Commissioner Raymond's analysis. And, possibly, no action will be taken on the gas contracts until the Metropolitan Electric Light Company is in a position to make an offer to do a part of the work.

Economy (?) in Oakland, Cal.—The town of Oakland, Cal., is suffering from a very severe attack of "economy." It is proposed to shut off the gas from the street lamps at midnight. Some other extremists wish to cut the gas off altogether for three months, notwithstanding the experience of the sister city of San Francisco. If, as is popularly supposed, it is the desire of Californians to attract Eastern people and capital to the Pacific slope we would suggest that such business as this would be the safest and surest method of excluding that which they so earnestly desire.

It is Sure to Kill.—The latest death caused by the inhalation of illuminating water gas, occurred in New York City on the afternoon of April 7. Lizzie Hoag, of No. 200 West Fifty-seventh street, was the victim. Before retiring for the night, at about 10 P. M., of date of April 5, she turned the bracket-light partially down. From some cause or other the light was extinguished, and the next morning she was found unconscious. She was removed to Roosevelt Hospital where death ensued on the date stated above.

Wedding Bells.—Margaret Daisy Cushing, daughter of Oliver E. Cushing, Esq., of Lowell, Mass., became Mrs. Edward Thayer Abbott, on Wednesday, April 4. The ceremony was celebrated at St. Annes Church, Lowell, Mass.

Improvements at the Poughkeepsie (N. Y.) Gas Works.—On account of the increased business of the Poughkeepie Gas Light Company, Superintendent Tracy informs us that he has found it necessary to erect two new benches of "fives."

Correspondence

[The Journal is not responsible for the opinions expressed by correspondents.]

Mr. Pearson on Water Gas.

Consumers' Gas Company,
Toronto, Ont., March 26, 1883.

To the Editor American Gas Light Journal:

Your article in the Journal of the 16th inst., headed "Carburetted Poison," calls for some comment. The statement that "previous to the introduction of water gas in New York city, for fifty years there is no record of death from inhaling coal gas," is, to say the least, a very remarkable one, and it naturally leads one to ask, Have any official records been kept in New York of deaths from coal gas or any other kind of gas? If not, your statement is certainly very misleading; and that no such records have been kept I infer from your remark that "a new column will be required in the statistics of the Health Department, headed 'Killed by Water Gas;'" and from the fact that the cases of death and suffocation published in your article are all taken from the newspapers. It is hardly to be supposed that the files of all the newspapers published in the city during the said fifty years (or, more properly speaking, forty-five years) would be accessible to you, and that if they were you or anyone else would search them through for the purpose. Evidently you wish it to be understood that prior to the introduction of water gas no deaths from inhaling coal gas had taken place. Now, if no official records have been kept, and the newspapers have not been searched, what warrant have you for this? From what has occurred elsewhere, it is very hard to believe that a number of deaths from the cause stated have not taken place in New York. To my personal knowledge five persons lost their lives from inhaling coal gas in this city alone within a very few years, during which the consumption of gas and the number of consumers could not have been one-seventieth of what they were in New York. And yet you would have it understood that in about ten times the length of time no death from coal gas suffocation or poisoning had taken place there!

In commenting on the list of accidents from inhaling gas published in your article you ask, "If 100 people are killed in five years in New York, where only two-fifths of the gas is carburetted poison," etc. Now I find from a former statement in the same article that these accidents took place in New York and Brooklyn; and I also find the total number reported to be 92—54 of the persons named being reported as dead and 38 suffocated. Did those said to have been suffocated die too? If not it makes a material difference. Again, were none of these accidents caused by inhaling coal gas? You would have it inferred that they were not, but it is not so stated. Then what proof is there, besides the statements in the papers, that all of these deaths were caused by gas poisoning?

You say that "it is stated to be a fact that no person found to be alive was ever known to die from the effects of inhaling coal gas." Now I happen to be in a position to give testimony directly to the contrary, for I have a perfect recollection, as well as a full record, of the case of the unfortunate death of a young lady in this city from inhaling coal gas, who lived in a state of stupor for over two days after she was discovered in an asphyxiated condition, and never regained consciousness. Was she not poisoned? If it was merely a case of suffocation why did not the "exposure to fresh air" bring her "immediate relief?" I may add that three other persons were asphyxiated at the same time, two of whom were resuscitated with great difficulty, and felt the effects of the poisoning for a considerable time afterward.

I regret to find that you have not treated the subject with your customary fairness, and that your article throughout displays a disposition to represent water gas in its worst possible light.

Sincerely yours,
W. H. Pearson.

THE AMERICAN
GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
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Manager—C. E. SANDERSON.

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MONDAY, APRIL 16, 1883.

Purifying the Products of Gas Combustion.

Dr. Joule, F. R. S., has just been recommending lime as a purifier of the products of gas combustion, thereby removing some of the objections which prevent the use of gas in picture galleries and other places. Slaked lime is placed in a vessel, the bottom of which, about one foot diameter, is slightly domed and perforated with fine holes. The vessel is suspended about six inches above the burner. It is found that a stratum of four or five inches of lime is sufficient to remove the acid vapors so far as to prevent them from reddening litmus paper. The lime seems in many respects to present important advantages over the zinc previously recommended.

Sad but True.

The Boston *Evening Transcript* says: "The best that can be said in favor of electric companies is that they are now endeavoring to do as little business as possible, for the more they do the more money they lose. Let any one investigate, even superficially, the business of the electric lighting companies in Boston, and he will find two classes of companies, and none others. The first have stock for sale, and care little to sell electric lighting. The second class are honestly managed by men of means, who offer no stock for sale, but are charging off their investment to profit and loss, and frankly confessing that until the business is re-organized upon a different basis, or new appliances have proved successful, there is no money in it, and that the more the business is extended the greater the amount of money lost." This statement is as true in New York as it is in Boston.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,
(with W. B. Scott & Co.,)
34 PINE STREET, NEW YORK CITY
APRIL 16, 1883.

☞ All communciations will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

	Capital.	*Par.*	*Bid.*	*Asked*
Gas Co.'s of N. Y. City.				
Central	$466,000	50	80	90
Harlem	1,800,000	50	98	100
" Bonds	170,000		—	—
Manhattan	4,000,000	50	238	42
Metropolitan	2,500,000	100	187	190
" Bonds	658,000	..	106	108
Mutual	3,500,000	100	115	120
" Bonds	1,500,000		100	102
Municipal	3,000,000	100	187	190
" Bonds	750,000		108	110
New York	4,000,000	100	124	127
Northern	125 000	50	—	95
" Scrip	108,000			
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	115	117
Citizens	1,200,000	20	74	77
" S. F. Bonds	320,000	1000	105	107
Fulton Municipal	1 500,000	100	70	80
Peoples	1,000,000	10	48	52
" Bonds	290,000	.	104	107
" "	250,000	...	88	90
Metropolitan	1,000,000	100	80	85
Nassau	1,000,000	25	59	—
" Ctfs.	700,000	1000	90	93
Williamsburgh	1,000,000	50	70	75
" Bonds	1,000,000	...	100	101
Richmond Co., S. I.	300,000	50	70	75
" Bonds	40,000	—	—	—
Out of Town Gas Companies.				
Buffalo Mutual, N.Y	750,000	100	72	75
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	80	85
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			170	155
Cincinnati G. & C. Co.			178	180
Consolidated, Balt.			41	42
Bonds			105	106
Central, S. F., Cal			35	—
Capital, Sacramento, Cal			—	55
East Boston, Mass	220,000	25	122	128
Hartford, Conn	700,000	25	120	128
Jersey City	750,000	20	155	160
Laclede St Louis Mo	1,200,000	100	114	117
Montreal, Canada	2,000,000	100	186	187
New Haven, Conn		25	144	—
Oakland, Cal			—	30¼
Peoples, Jersey City		...	72	75
" " Bds.			...	...
Rochester, N. Y		50	70	80
Washington, D. C	2,000,000	20	235	245
Wilmington, Del		50	174	...
Yonkers		50	30	32
St. Louis Missouri	600,000	50	250	254
San Francisco Gas-Co., S. Fr'isco Cal.			56¼	56¾
Toledo, Ohio			95	97
Troy, Citizens	600,000	100	—	—

The following shares were sold at auction, Wednesday, April 11: Twenty shares New York Gas Light Company, New York City, @ 126½; 20 shares same company, @ 127½; 130 shares Harlem, of New York City, @ 98½ and 99¾; 50 shares Mutual, New York City, @ 119; 50 shares Peoples, Brooklyn, N. Y., @ 49¼; 34 shares Elizabethtown (N. J.) Gas Light Company, @ 105. Consolidated, Baltimore, Md., shows a drooping tendency; Central, of San Francisco, is is also weaker. Oakland (Cal.) Gas Light Company has declared a dividend amounting to $6,000. San Francisco Gas Light Company, San Francisco, Cal., has been quite active, at hardening prices, sales having been made at as high a notch as 59½; the latest recorded transactions have shown a slight decline, at prices ranging from 56¾ to 57½, the stock is firmly held. General quotations throughout the country show decided improvement in gas securities.

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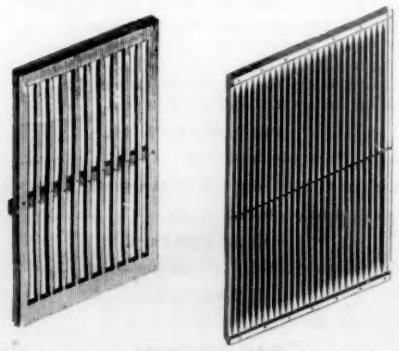

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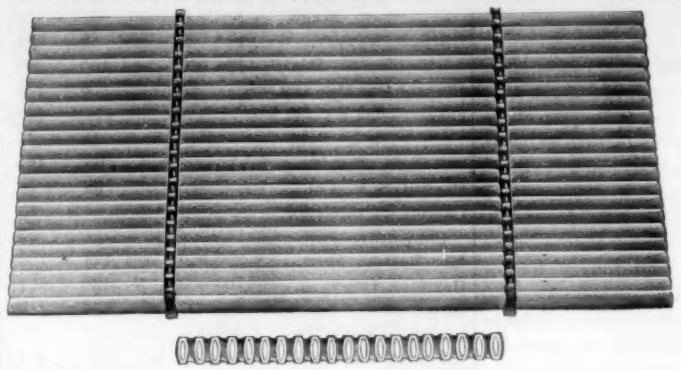

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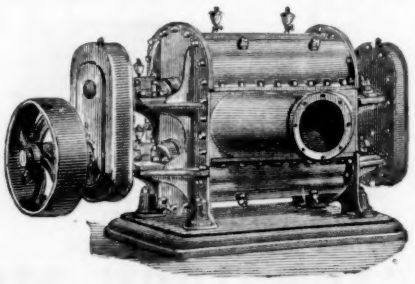

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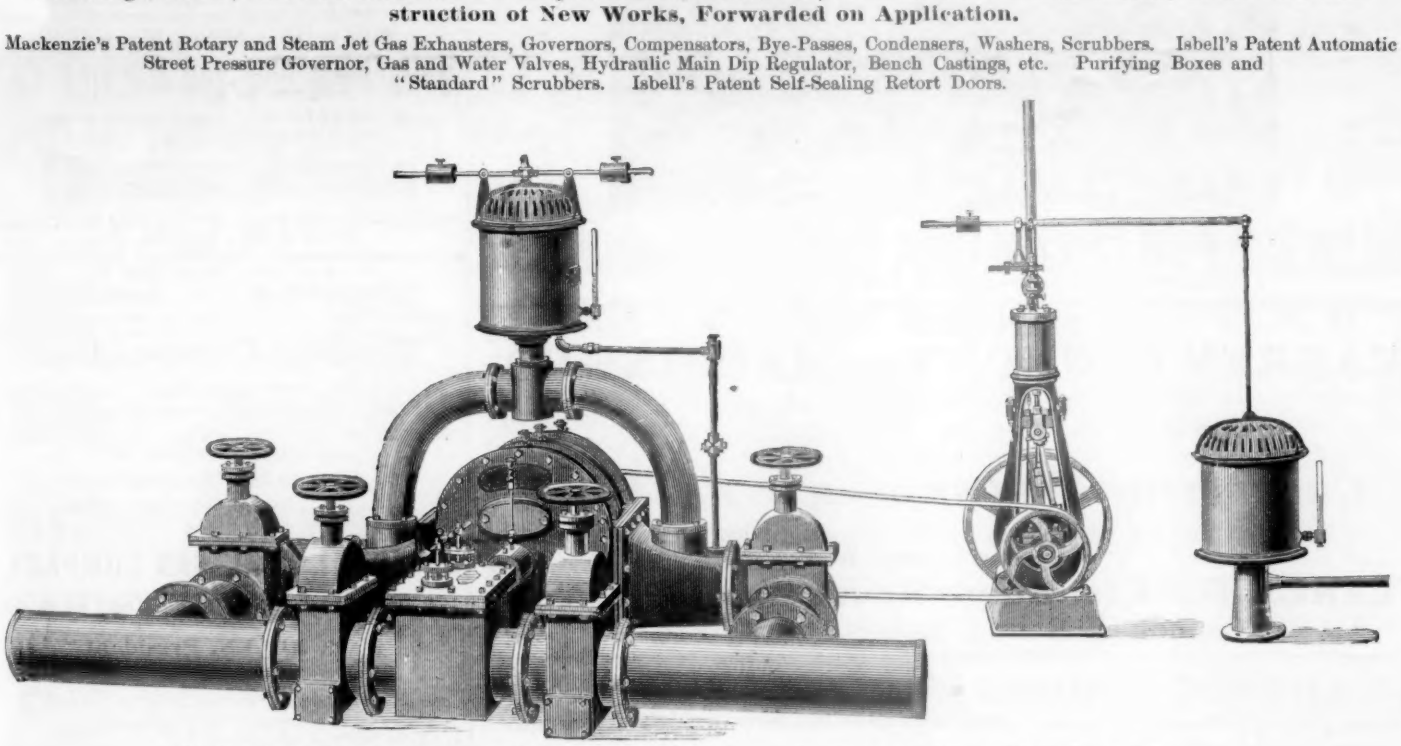

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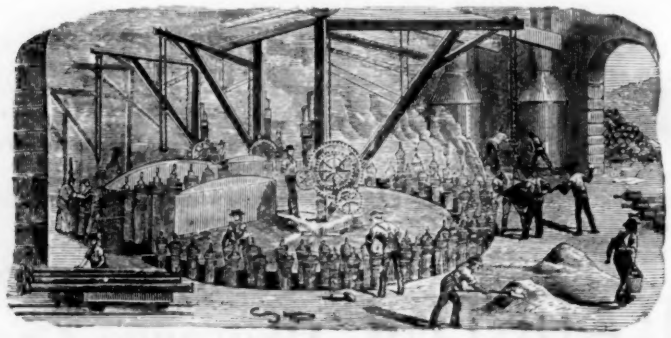

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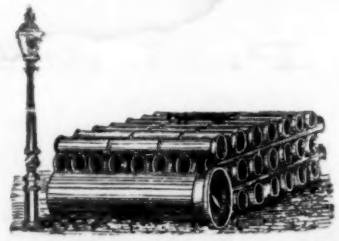

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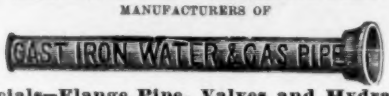

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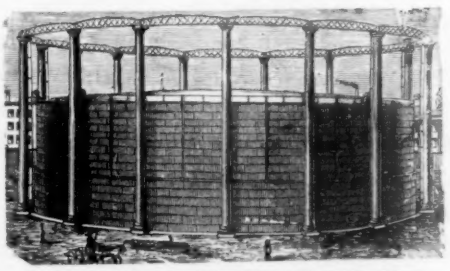

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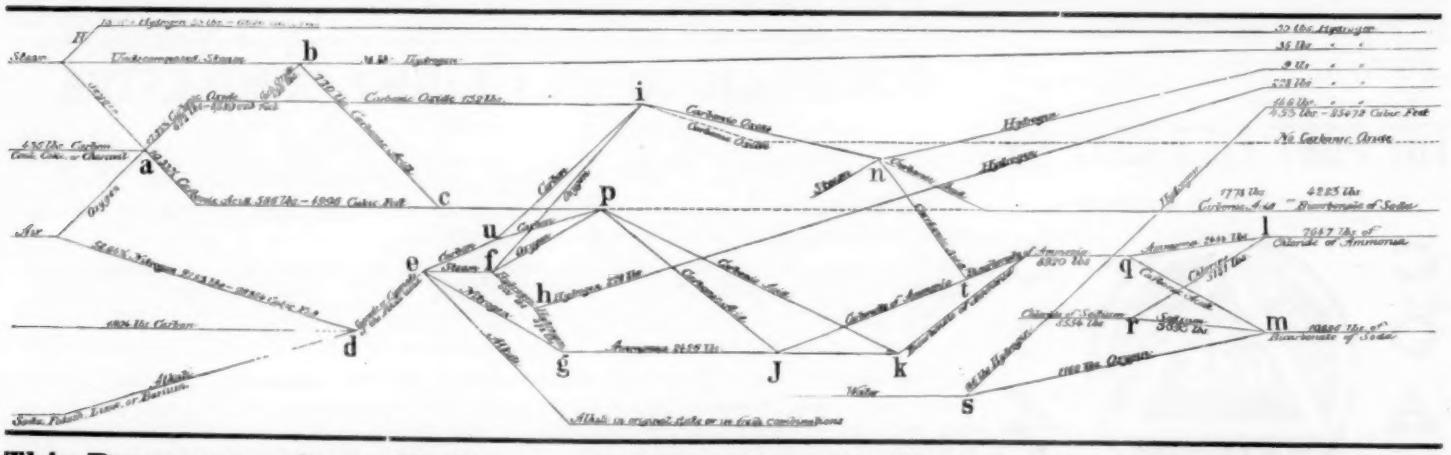

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STATION METERS. PRESSURE & VACUUM REGISTERS. PORTABLE TEST METERS.
EXHAUSTER GOVERNORS. PRESSURE & VACUUM GAUGES. EXPERIMENTAL METERS.
DRY CENTRE VALVES. CRESSON GAS REGULATORS. AMMONIA TEST METERS.
GOVERNORS FOR GAS WORKS. MARSLAND WATER METERS. BAR AND JET PHOTOMETERS.

Manufactories:
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GAS STOVES,
SUGG'S "STANDARD" ARGAND BURNERS,
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Wet Meters, with Lizar's "Invariable Measuring" Drum.

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Successors to Harris & Brother.

ESTABLISHED 1848.

PRACTICAL GAS METER MANUFACTURERS,

Continue as heretofore at the OLD ESTABLISHMENT, Nos. 1115 and 1117 Cherry Street, Philadelphia, Pa.

To manufacture Wet and Dry Gas Meters, Station Meters, Experimental Meters, Meter Provers, Centre Seals, Governors, Pressure Registers, Indicators, Photometers, and all kinds of Gas Apparatus; Also furnish all other Articles appertaining to the use of Gas Works.

From our long Practical Experience of the Business (covering a period of 33 years) and from our personal supervision of all Work, we can guarantee all orders to be executed promptly, and in every respect satisfactorily.

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Successors to W. W. GOODWIN & CO.

No. 1012, 1014 and 1016 Filbert Street, Philadelphia, Pa.

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MANUFACTURERS OF GAS STOVES FOR COOKING AND HEATING PURPOSES.

Dry and Wet GAS METERS, Station Meters (Square, Cylindrical or in Staves) Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, Etc., Etc., Meter Provers (sizes 2, 5 and 10 feet), Pressure Guages of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4 inch, 6 inch and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Centre Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete—also Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

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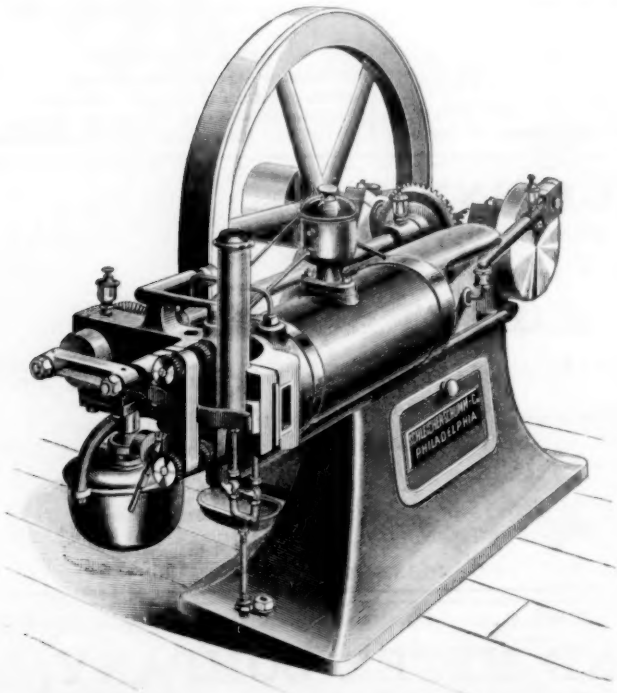

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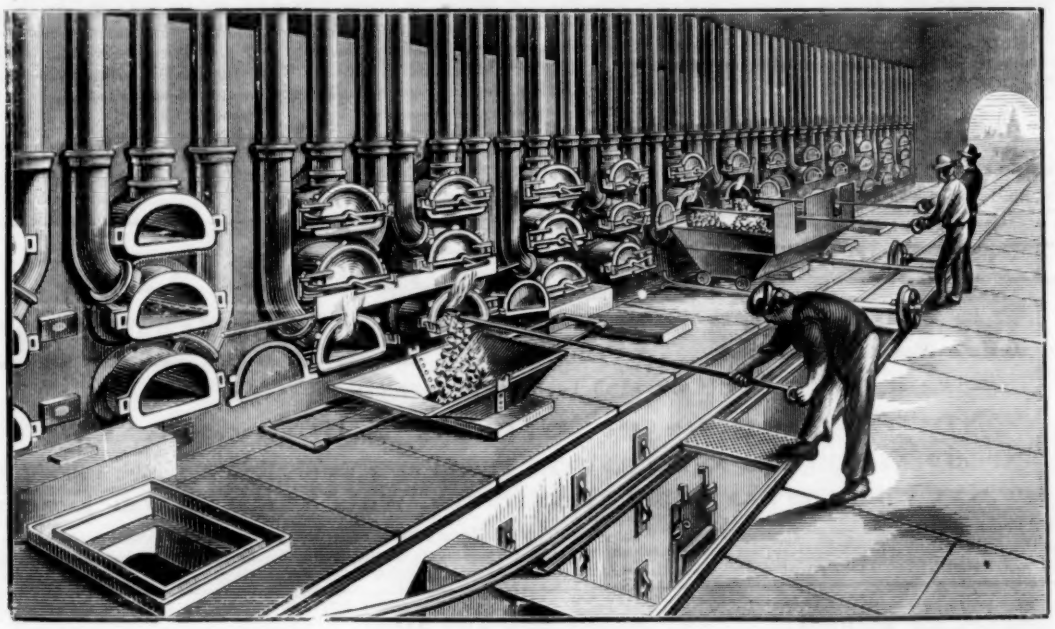

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